

**THE APPLICATION OF HUMAN FACTORS AND ERGONOMICS (HFE) TO
COMMUNITY-SPORT ORGANISATIONS IN RESOURCE SCARCE CONTEXTS: A
CASE STUDY OF GRASSROOTS FOOTBALL IN MAKANA, EASTERN CAPE**

BY

BENNETT RYAN

THESIS

Submitted in fulfilment of the requirements of the Degree

Doctor of Philosophy

Department of Human Kinetics and Ergonomics

Rhodes University, 2020

Makhanda, South Africa

“If you have come to help me, you are wasting your time. If you have come because your liberation is bound up with mine, then let us work together.”

– Lilla Watson

ABSTRACT

Background: Modern Human Factors and Ergonomics (HFE) focuses on the optimisation of complex socio-technical systems and has been challenged to contribute to broader societal issues. An example is within grassroots football organisations in resource-scarce areas such as Makana, South Africa. Through embedded participatory approaches, the research problem was co-constructed: To investigate the socio-technical system of the Makana Local Football Association (LFA).

Method: A useful complex system modelling tool is that of Cognitive Work Analysis (CWA), with its 5 phases used to identify constraints and affordances. Three perspectives were adopted for the application of an adapted (to suit participant characteristics) CWA to the Makana LFA: 1) how work is prescribed by the governing body SAFA, 2) how subject matter experts (SME) disclose its current functioning, and 3) how SMEs imagine it could function. Five SMEs attended 12 three-hour workshops to complete the latter two perspectives.

Results: The composite work domain analysis between work as prescribed and work as disclosed identified significant mismatches between how policymakers envision the system and how SMEs report its functioning. Key differences in perspectives included the fundamental purpose of the Makana LFA, while only four of 22 functions operate within the Makana LFA. Participants also identified key affordances for the LFA such as reorientation as a community sports organisation.

Discussion: Comparison between perspectives indicated four mismatches. 1) SAFA views the LFA as the foundation of the talent identification and development infrastructure of South African football. SMEs view it as a community centred organisation. 2) A lack of human capacity is evident at the community level of Makana football. 3) Funding and assets are absent at this grassroots level. 4) The LFA relies on other stakeholders, but these relationships are not formalised. Policymakers, therefore, have a lack of knowledge of the contextual challenges faced by LFA administrators. It is recommended that SAFA view the LFA as a community sport organisation,

focusing on improving human capacity, increasing funding, and formalising stakeholder networks. Furthermore, conceptual models from CWA provide explicit socio-technical system redesign recommendations.

Conclusion: Large mismatches between the organising body SAFA and the actual functioning of the LFA significantly hinder the effective management and running of football at a grassroots level in resource-scarce contexts in South Africa. The perspectives approach to CWA was useful in elucidating the constraints and affordances of the Makana LFA socio-technical system and informing redesign opportunities. Systems HFE methodology is therefore well placed to contribute to broader societal issues within resources scarce contexts such as football in Makana. Furthermore, the philosophical underpinnings of systems based HFE were successful in the development of sustainable participatory research within the South African grassroots football context.

ACKNOWLEDGEMENTS

First and foremost, I would like to thank my supervisor, Mr Andrew Todd. If I could put two names on this thesis, I would. Thank you for your mentorship, guidance and expertise throughout my postgraduate career. It has been a privilege to explore the philosophy of science with you.

To the Makana LFA and the participants of this study. I will be forever indebted to you for welcoming me into your community. It has been an honour to work with you.

I would also like to thank the complex systems in sport research group. For the many coffee-fuelled discussions and brainstorming sessions.

To Gavin Callow and Ashley De Beer for their willingness to follow me on this journey. Thank you.

To Dr Jono Davy for your mentorship, passion, and dedication to social progress.

I would also like to thank the Human Kinetics and Ergonomics Department and in particular, all volunteers for the community engagement project. Your enthusiasm and hard work are inspiring.

Thank you to the National Research Foundation for making this research possible.

To my family, thank you for your unwavering support and love.

To my dogs, Teddy and Poppet, thank you for being cute.

Finally, to my wife, Pam. Thank you for being practically perfect in every way. I love you 😊

TABLE OF CONTENTS

INTRODUCTION.....	1
Prologue:	1
REVIEW OF LITERATURE AND RESEARCH PROBLEM FORMATION	5
Introduction.....	5
Background to Human Factors and Ergonomics	5
Sociotechnical Systems Theory.....	8
Role of Human Factors and Ergonomics	12
Approaches to HFE Application	13
Fundamentals of Systems HFE Application.....	16
Participatory Research	22
Study Contextualization	26
<i>Introduction</i>	<i>26</i>
<i>Sport and Physical Activity.....</i>	<i>27</i>
<i>Talent Identification and Development in Football</i>	<i>28</i>
<i>Football in South Africa</i>	<i>29</i>
<i>Football related research in South Africa</i>	<i>31</i>
Initial Problem Formulation	43
Case Study Context: The Eastern Cape and the Makana Municipality.....	43
<i>The Platform for Needs Identification</i>	<i>46</i>
<i>Embedded Research</i>	<i>47</i>

<i>Stakeholder Identification</i>	48
<i>An Emergent Embedded Research Program</i>	50
Refined Problem Formulation	51
System Mapping and HFE Complex Systems Tool Selection	52
<i>Summary and tool selection</i>	62
Final Problem Statement	63
METHODOLOGY	64
Introduction.....	64
Study Design	64
Defining System Boundaries	66
Selection of General System Mapping Tool - Cognitive Work Analysis (CWA)	67
Approach to CWA of the Makana LFA.....	69
Participant Characteristics	72
<i>Analyst</i>	72
<i>Subject Matter Experts (SME)</i>	72
Cognitive Work Analysis Adjustments	75
<i>Work Domain Analysis (WDA)</i>	75
<i>Contextual Activity Template (CAT)</i>	76
<i>Strategies Analysis (StrA)</i>	76
<i>Social Cooperation and Organization Analysis (SOCA)</i>	77
<i>Worker Competency Analysis (WCA)</i>	78

<i>Summary of the CWA Framework for application to the Makana LFA</i>	78
Experimental Procedures	81
<i>Ethical Clearance:</i>	81
<i>Cognitive Work Analysis Procedures</i>	81
Statistical Procedures	88
RESULTS	89
Introduction	89
Work Domain Analysis (WDA).....	90
<i>Work as Prescribed</i>	90
<i>Work as Disclosed</i>	93
<i>Work as Imagined</i>	98
Control Task Analysis (ConTA) – Contextual Activity Template (CAT).....	102
<i>Work as Disclosed</i>	102
<i>Work as Imagined</i>	105
Social Cooperation and Organization Analysis (SOCA-CAT)	107
<i>Work as Disclosed</i>	107
<i>Work as Imagined</i>	111
Strategies Analysis – Work as Disclosed and Work as Imagined	114
<i>Stakeholder Identification</i>	128
Worker Competencies Analysis (WCA)	130
Identifying Mismatches (WAP vs WADi).....	132

<i>Fundamental Purpose</i>	135
<i>Values and Priorities</i>	136
<i>Functions</i>	137
<i>Activities</i>	137
<i>Resources</i>	138
<i>Conclusion</i>	139
INTEGRATED DISCUSSION	140
Part 1 - Analysis of the Makana LFA	140
<i>Why do mismatches matter?</i>	140
<i>Mismatches between SAFA and the Makana LFA</i>	141
<i>Mismatch 1: Purpose of the Makana LFA</i>	142
<i>Implications of Mismatch 1</i>	142
<i>Mismatch 2: Human Capacity</i>	144
<i>Implications of Mismatch 2</i>	146
<i>Mismatch 3: Funding Availability</i>	147
<i>Implications of Mismatch 3</i>	148
<i>Mismatch 4: Infrastructure and Stakeholder Networking</i>	149
<i>Implications of Mismatch 4</i>	150
<i>Systems Lens: The Messy Reality</i>	152
<i>Interactions and Archetypes</i>	159
<i>Systems Lens: Learning from Local Adaptation</i>	161

<i>Mismatch 1: Reimagining Purpose and Closing the Gap</i>	162
<i>Mismatch 2: Rising to the Capacity Challenge</i>	166
<i>Mismatch 3 and 4: Funding and Stakeholder Networking</i>	170
<i>Informing Redesign – Recommendations from CWA</i>	170
<i>Prescribed documentation: Incorporating Constraints and affordances</i>	171
Part 2 - Contribution to the Discipline	177
<i>Introduction</i>	177
<i>Research Context</i>	177
<i>Embedded Research Program</i>	178
<i>Study Design Review</i>	184
Part 3 – Personal reflections on the journey: Basic science to embedded, engaged, responsive research design	191
<i>Introduction</i>	191
<i>Research Journey</i>	191
<i>Participatory Approaches</i>	194
<i>Reconceptualising Embedding: Community-Engaged Research Group</i>	194
<i>Reconceptualising Embedding: The Makana LFA</i>	197
<i>Socio-technical Systems: Insight into Complexity</i>	198
<i>Barriers and Challenges</i>	200
CONCLUSIONS	202
Part 1 – Makana LFA Analysis	202
Part 2 – The Application of Systems HFE in Makana	204

Part 3 – Future Directions	205
Part 4 - Limitations	206
Epilogue	208
LIST OF APPENDICES	251
Appendix 1: Cognitive Work Analysis Guide.....	252
Appendix 2: Letter to Participants	265
Appendix 3: Informed Consent	268
Appendix 4: Participants Background Questionnaire.....	270
Appendix 5: Workshop Evaluation questionnaire	271
Appendix 6: Work as Prescribed – Work Domain Analysis.....	274
Appendix 7: Work as Disclosed – Work Domain Analysis	291
Appendix 8: Work as Disclosed – Contextual Activity Template.....	304
Appendix 9: Work as Disclosed – Strategies Analysis.....	308
Appendix 10: List of Direct Quotes from Subject Matter Experts	328
Appendix 11: Workshop Review Questionnaire Participant Responses	333

LIST OF FIGURES

Figure 1: General work system model (Carayon et al., 2006). _____	11
Figure 2: League structures as defined by the SAFA Technical Masterplan (2012) _____	30
Figure 3: General work system model of South African football research. _____	41
Figure 4: Study design of the current research study _____	65
Figure 5: Diagram to demonstrate the perspectives potentially informing system redesign within the current analysis of the Makana LFA. ____	71
Figure 6: Work domain analysis for work as prescribed of the Makana LFA _____	91
Figure 7: Work Domain Analysis for work as disclosed of the Makana LFA _____	94
Figure 8: Work Domain Analysis for work as imagined for the Makana LFA. _____	99
Figure 9: Mind map of psychosocial qualities of Makana LFA committee members _____	131
Figure 10: Composite work domain analysis of work as prescribed and work as disclosed _____	134
Figure 11: Model to show the socio-technical system of the Makana LFA. _____	154
Figure 12: State of JD Dlepu Stadium _____	158
Figure 13: Proposed embedded research program theoretical framework. _____	181
Figure 14: Study Design of the current investigation _____	184

LIST OF TABLES

Table 1: Table to show the six notions of successful HFE systems theory application, as noted by Wilson (2014). _____	17
Table 2: South African specific football studies published to date ___	33
Table 3: Stakeholders and partnerships associated with the complex systems in sport research group _____	48
Table 4: Review of HFE systems-based tools _____	54
Table 5: Cognitive Work Analysis Summary (Jenkins et al., 2008)___	68
Table 6: Demographic characteristics of Subject Matter Experts. The researcher is SME number 5. _____	74
Table 7: WDA abstraction hierarchy terms for Makana LFA analysis _	75
Table 8: CWA framework for application to the Makana LFA _____	79
Table 9: Inclusion and exclusion criteria for work as prescribed literature search _____	82
Table 10: Results from literature search for prescribed SAFA documentation _____	85
Table 11: CWA with Subject Matter Experts – Session Summary ___	86
Table 12: Summary of CWA for Work as prescribed _____	90
Table 13: Subject matter experts proposed committee structure of the LFA. _____	100
Table 14: Activities and resources additions to the work domain analysis of the Makana LFA _____	101
Table 15: CAT for work as disclosed for the Makana LFA. _____	104
Table 16: Contextual activity template for work as imagined of the Makana LFA. _____	106
Table 17: Active committee members and related stakeholders for the Makana LFA. _____	108
Table 18: SOCA-CAT for work as disclosed of the Makana LFA. ___	109
Table 19: Distribution of committee work for the Makana LFA as proposed by subject matter experts. _____	111
Table 20: SOCA-CAT for work as imagined of the Makana LFA. ___	113
Table 21: Constraints identified within Makana LFA and the related strategy recommendation. _____	115

Table 22: Identified affordances for the Makana LFA and associated implementation strategy	124
Table 23: Identified stakeholders and their potential contributions to the Makana LFA	129
Table 24: Colour legend for composite work domain analysis diagram.	133
Table 25: Summary of mismatches between Work as prescribed and work as disclosed.	151
Table 26: Capacity dimensions and critical elements of community sport organizations (adapted from Clutterbuck & Doherty (2019))	165
Table 27: Dimensions of community capacity (Edwards, 2015)	169
Table 28: Constraints and related strategies as identified and discussed by subject matter experts during cognitive work analysis process	172
Table 29: Affordances and related strategy as identified by subject matter experts during cognitive work analysis process	174

RELEVANT ABBREVIATIONS

HFE – Human Factors and Ergonomics

STS – Sociotechnical Systems

IEA – International Ergonomics Association

SSoS – Sustainable System of Systems

FACE – Francophone Activity Centred Ergonomics

PAR – Participatory Action Research

PE – Participatory Ergonomics

TID – Talent Identification and Development

FIFA - Fédération Internationale de Football Association

SAFA – South African Football Association

PSL – Premier Soccer League

LFA – Local Football Association

DSRAC – Department of Sport, Recreation, Arts and Culture

SME – Subject Matter Experts

SCM – Swiss Cheese Model

HFACS - Human Factors Analysis and Classification System

ATSB - Australian Transport Safety Bureau

HFIT – Human Factors Investigation Tool

STAMP – Systems Theoretic Accident Model and Processes

FRAM - Functional Resonance Analysis Method

HTA – Hierarchical Task Analysis

EAST – Event Analysis of Systemic Teamwork

AH – Abstraction Hierarchy

CWA – Cognitive Work Analysis

WDA – Work Domain Analysis

ConTA – Control Task Analysis

CAT – Contextual Activity Template

StrA – Strategies Analysis

SOCA – Social Organization and Co-operation Analysis

WCA – Worker Competency Analysis

CSO – Community Sport Organization

WAP – Work as Prescribed

WAD – Work as Done

WADi – Work as Disclosed

WAI – Work as Imagined

CIEHF - Chartered Institute of Ergonomics and Human Factors

*Abbreviations are used throughout this document. For ease of interpretation, this list should be used as a reference throughout.

INTRODUCTION

Prologue:

It is a rainy Thursday afternoon, and our meeting with football club representatives starts at 17:30. Due to the weather, I have several pick-ups to do on the way up to the JOZA location, the poor part of town. First off, it's my colleague from the department. He usually is still working late after a departmental practical. He jumps in, and as we head to the next stop, we chat about the plans for the meeting. We take a moment to laugh at the deadlines we have set for the leagues to start; there is no way those will stick. Next, we pick up our deputy chairperson from the butchery. He has worked there as a blockman for decades and bang on five o'clock; he is waiting outside. A small benefit is the little bit of "dry wors" he hands out. It's the best in town. We continue our drive up the hill as he hands over player registration forms that clubs dropped off throughout the day. "Only about 100 today", he laughs.

Next stop is to pick up our general secretary from his house. The potholes are shocking in JOZA, and the car takes a beating. The rain doesn't help, and I have to avoid the cows trying to find shelter and the kids still playing football in the road. Football is life around here. The secretary's mom hears my car (as usual) and shouts for him to get a move on. He runs out, checks his pockets, and runs back in to grab the stuff he forgot. "Every time", we say, chuckling. We drive to the meeting venue. The building is used for municipal planning, and it is somewhat ironic that it is falling apart. Our other deputy chairperson is there waiting with the keys, and with a smile greets us, and we head inside. We set out the meeting venue and sit down to wait. It's around 17:30.

Club representatives slowly start making their way inside. We need 12 for quorum, and at 18:15 we have made it to 7 reps. I glance around; no one is surprised. We try calling the club members. The rain doesn't help as few have their own transport or can afford the taxi fare. It looks like this will be an information-sharing meeting and not an official one. More delays it seems. I chair the meeting. No issues until I discuss prize money, and there

is lots of debate. Trouble is the football association only has R5000 (\$285) in the account, and so there is no way we are increasing prize money. "Maybe if teams pay more to affiliate at the beginning of the season?". "No chance" is the response. Discussions shift to the leagues. "When can we start, I have players who want to change club because they can play in a better division. We need to start now". Football is life around here.

Only a few clubs have email addresses so "can the association print registration forms? Can you also assist with ID photos? We can't afford them". We agree and make plans to extend the deadline to sign up for the leagues. Its 20:30 and the meeting is still in full swing. "What about safety? A woman was raped at the stadium last weekend, what can the association do about safety?" I say we have tried to negotiate with the municipality, but security is just not happening. "It's just not good enough". They are right.

"What about the field in general?" one club member asks. "It's the only one we have, and there is no grass, no lines, no drainage and glass everywhere". No one has any money to spend on the field, and so nothing can be done. Clubs are not supposed to practice on our only field, so stopping that may help. We make the suggestion. "Where should we practice then? There are no other fields." There is not much we as the local football association can do, as the municipality controls and operates the stadium. I am reminded of the youth player who broke his leg when the poles collapsed on him last season. What more can we do?

Around 21:30 it's time to end. 8 people need a lift so I will have to make two trips. Those at the top of the hill get dropped off, and it's really pouring now. The general secretary asks to borrow my phone; he needs to contact the mother of his new-born child to make plans for tomorrow. He is unemployed, so he doesn't have much money. But he still manages to provide for her. I have the utmost respect for him. The deputy chairperson has a Kaiser Chiefs FC flag raised outside his house as we drop him off. Football is life around here. We pick up the last few club representatives and drop them on the way down the hill. I get asked if I have a spare soccer ball to lend their club. I still have a few in my boot from the community project the day

before. He says he will bring them back next week. I laugh and say, “don’t worry about that”. Football is life around here.

It’s just my colleague and me in the car now. We chat about the plans for tomorrow. We need to go to the municipal sports department to arrange the wish list for sponsorship. They called us earlier that day saying tomorrow is the submission deadline. The late notice is frustrating, but we have to do it otherwise no trophies this season. We also need to make more junior registration cards for the players so they can compete on Saturday. We split the pack, and agree to check that all the forms are submitted correctly. Some have no ID documents, but “it’s the u13s so let’s just let them play”. Both of our phones light up at the same time. Messages from the association coach WhatsApp group. “When is the league start? What are the fixtures for the preseason tournament next weekend?” I message and say I will be at the field on Saturday morning to hand out cards and will have registration forms and the information for clubs. Satisfied, the coaches’ message “thanks, leader.” Football is life around here.

The above anecdote from my experience as an engaged and embedded student researcher, and consequently as an administrator for my local football association in Makana, highlights a crux of the current thesis: Football is essential in South Africa and means many different things to different people. A distraction, an upliftment opportunity, a way to give back. What is evident is that football is highly complex in our South African context. Studying it was therefore very important to us, to contribute to growing and developing the game. As our academic department has components of both sports’ science and ergonomics, it was logical to investigate the usefulness of ergonomics and its systems-based approach in the analysis of local football. We wanted to use these theoretical frameworks to contribute to solving local problems.

This thesis describes a 7-year journey. The process was highly emergent and iterative as we engaged with multiple disciplines and their theoretical approaches. As a result, this thesis has some adjustments to the typical structure in an attempt to represent the development of the project and to

do justice to our research journey. As Mother Teresa said, “Honesty and transparency make you vulnerable. Be honest and transparent anyway”.

In particular, there are three iterations of the formation of the problem, which was dictated by the fact that the characteristics of the system emerged over time. Furthermore, literature will appear for the first time in sections that would not be typical in a thesis. Again, this is due to the emergent characteristics of a study of this nature. As affordances in the system became apparent, it was necessary to explore those in more detail, including literature that may not have been perceived as important prior to the study. In order to stay faithful to the process, such iterations of the research design have been included.

CHAPTER 1

REVIEW OF LITERATURE AND RESEARCH PROBLEM FORMATION

Introduction

The current study utilized several theoretical considerations to engage with the context of local football in South Africa. The first part of the review of literature will, therefore, have the following structure: Background to Human Factors and Ergonomics (HFE), Sociotechnical Systems Theory, the Role of HFE, Approaches to HFE application, Fundamentals of Systems HFE, and Participatory Research. The purpose is not a comprehensive review of HFE, its history, its different approaches and applications. It is rather to describe the modern systemic nature of HFE and its strategies for research application.

Furthermore, as a case study, it is important to frame the unique context of local football in Makana, the nature and challenges of research in this area and our philosophy to research application. Consequently, the second part of the review will engage with: Football in South Africa, South African Football Research, Contextualization of the Eastern Cape and Makana Municipality, The Platform for Needs Identification, Embedded Research and System Mapping and Complex System Tool Selection. This structure is used to describe how the research project evolved and the overall purpose was identified. Therefore, the evolution of the research question (starting broadly with football in South Africa) is noted progressively within this section.

Background to Human Factors and Ergonomics

The discipline of ergonomics has undergone significant growth in recent decades, as interest in the efficiency of work and the work environment has grown substantially (Dul *et al.*, 2012; Haslam & Waterson, 2013; Zink, 2014; Radjiyev *et al.*, 2015; Thatcher *et al.*, 2018). As discussed in a seminal paper by eminent ergonomist, John Wilson in 2000, the broad range of specialization and the vast domains of application have resulted in difficulty

in defining the discipline and the scope of competency. Wilson further notes that it is vital for any discipline to become introspective and to ensure rigorous self-examination. It is, therefore, necessary to ground the discipline to understand its role in optimizing the work environment and human well-being.

Formal understanding of the interactions between people and their working environments can be found as far back as ancient Greece, as well as from more recent medieval accounts (Wilson, 2000). Additionally, documentation exists from Poland and Germany over 100 years ago that engages with how work is performed (Girault, 1998; Marmaras *et al.*, 1999). However, the modern history of Ergonomics is typically associated with the end of the second world war, and the integration of several different disciplines such as physiology, anatomy, psychology, industrial hygiene, and engineering, which all engaged with human interactions in the workspace (Chapanis, 1996; Wilson, 2000).

Historically, ergonomics has been categorized into domains of specialisation: physical, cognitive and organizational ergonomics (Karsh *et al.*, 2014). Physical and cognitive ergonomics comprise what is thought of as micro-ergonomics and the focus on the “man-machine system” (Morel *et al.*, 2009). While traditionally seen in isolation, authors such as Marras & Hancock (2014) have noted the importance of integrating the physical and cognitive dimensions to acknowledge the “totality of the human-system behaviour and performance and consider systems design interactions which result from these collective effects” (p.1). At this point, it is prudent to note the growth of Human Factors, a congruent development of the discipline in America. Human Factors had substantial inputs from the disciplines of psychology and engineering. Furthermore, Wickens, Gordon, & Liu (1998) comment that the field of Human Factors originally grew out of a reasonably narrow concern for human interaction with physical devices and a focus on micro-ergonomics.

Rasmussen (1993) notes the possible confusion from the use of the term human factors as a description of problems to do with “the mechanisms governing the behaviour of large socio-technical systems in a turbulent

environment.” There is often an overemphasis on the human component, which may lead to a somewhat reductionist view. The terms Human Factors and Ergonomics (HFE) have, as a result, been combined and summarized by Wilson (2000): “our field of study is the theory and practice of understanding people and their characteristics (the human factors) in relation to design” (pg.559).

As acknowledgement of the complexities of the human work system grew, so too did interest in organizational ergonomics. Also known as macro-ergonomics, this domain is concerned with the optimisation of socio-technical systems, including their organisational structures, policies, and processes (Hendrick, 1997; Hendrick & Kleiner, 2002). Conceptually macro-ergonomics was originally defined as a top-down technical systems approach to the design of organizations, work jobs, and related human-machine, human-software, and human interfaces (Hendrick, 1991). However, as discussed by Hollnagel (2014), there are concerns with the nature of this design-driven approach as some HFE application still tends to define the system narrowly. What is essentially a micro ergonomics focus to the system, is evident in the literature for understanding larger systems.

Hollnagel (2014) proposes that design should perhaps be understood as the activity or process of designing rather than design as a product or outcome. There should be a focus on function rather than structure (Helander, 1997). For instance, introducing a new ‘tool’ not only affects how work is done but also how it is conceived and organised and may lead to unforeseen changes. The purpose of HFE “design”, therefore, cannot be to engineer the ‘hard’ system to achieve well-defined objectives (Checkland, 2000), but rather to tackle real-world problems (Hollnagel, 2014).

Consequently, authors such as Carayon *et al.* (2006), Dul *et al.* (2012), Hollnagel (2014), Karsh *et al.* (2014) and Wilson (2014) have noted the importance of taking a systems view to understand the nature of work, attempting to integrate the domains of specialisations and acknowledging the vast number of interacting elements.

Wilson (2014) goes as far as to suggest that any study, investigation, analysis, or development which does not take a systems view is, in fact, not HFE at all. The International Ergonomics Association (IEA) therefore defines ergonomics as “the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data, and methods to design to optimize human well-being and overall system performance.”

Sociotechnical Systems Theory

As HFE is predominantly a systems discipline (Thatcher & Yeow, 2016), it is necessary to engage with this theoretical framework. According to Wilson (2012), systems HFE examines and enhances the design of a system, and people’s interactions with it, rather than concentrating on individual components. The study of systems, therefore, regards collective, or system-wide, activities as the fundamental object of study; for this reason, complex systems can be understood as an alternative paradigm to reductionism, which attempts to explain systems in terms of their integral parts and the individual interactions between them. Wilson (2014) describes the concept of a system as the following:

“A system is a set of inter-related or coupled activities or entities (hardware, software, buildings, spaces, communities and people), with a joint purpose, links between the entities which may be of state, form, function and causation, and which changes and modifies its state and the interactions within it given circumstances and events, and which is conceptualised as existing within a boundary; it has inputs and outputs which may connect in many-to-many mappings; and with a bow to the Gestalt, the whole is usually greater (more useful, powerful, functional etc.) than the sum of the parts” (pg.6).

The goal of systems HFE is systematically discovering a system’s dynamics, constraints, conditions, and elucidating principles (purpose, measure, methods, tools, etc.). A systematic understanding provides an effective platform to achieve the fundamental aims of HFE (Bridger, 2008):

Optimization of both 1) human well-being (a social goal), and 2) total system performance (an economic goal). While it is not possible to note all components and interactions, practitioners and researchers alike should aim to be as comprehensive as possible. This, in turn, informs effective design and redesign to achieve optimized equifinality (Neumann & Village, 2012). Equifinality refers to the concept that different routes can be used to reach the same ends. Thus an optimized system will have redundancy and opportunities for those who act within it to solve emergent issues (Hollnagel *et al.*, 2015).

An important conceptualization is that of the socio-technical system (STS) and accompanying theoretical considerations (Clegg, 2000; Carayon, 2006; Walker *et al.*, 2008). Socio-technical refers to the interrelatedness of social and technical aspects of an organization or work system. This terminology originated with Trist, Bamforth and Emery (1951) from the Tavistock institute in mining operations. They coined the term socio-technical systems. Additionally, Albert Cherno, in 1976, consolidated STS theory when he released his paper on socio-technical principles to design. STS theory has since been built on by authors such as Clegg (2000), Walker *et al.* (2008) and Carayon *et al.* (2015). The theoretical overview focuses on understanding the interaction of social and technical factors and the consequential conditions for successful (or unsuccessful) organizational performance. The main principle is that optimization of each aspect alone (social or technical) tends to increase not only the quantity of unpredictable, “un-designed” relationships but those relationships that are hazardous to the system’s performance (Walker *et al.*, 2008). Thus, HFE aims for joint optimization of these aspects.

Historically, HFE practitioners have identified socio-technical systems as having clearly defined boundaries where the individual components of the system can be separated, and laws can be established on how the different components interact (Dul *et al.*, 2012). However, this is an oversimplification of relationships, as complexity cannot be dealt with using the linear model paradigm (Reason, 1990; Walker *et al.*, 2010; Dekker *et al.*, 2013; Zink, 2014). As noted by Salmon *et al.* (2012) and Dekker *et al.* (2011), “If a

system can be described fully and taken apart and put together again, it may be complicated, but it is not complex". Complex systems, therefore, have the following characteristics (Dekker *et al.*, 2011; Salmon, McClure, *et al.*, 2012):

- **Complex systems are open systems** – complex systems are open to influences from the environment in which they operate and also influence the environment in return.
- **Ignorance of components** – components that make up the system are ignorant of the behaviour of the system as a whole and do not comprehend the effects of their actions on the behaviour of the overall system.
- **System complexity** – it is the system that is complex rather than the components themselves.
- **Continuous inputs from components** - complex systems do not operate in a state of equilibrium; inputs need to be made by components at all times to keep the system functioning.
- **Path dependence** – complex systems have a history, and their past influences their present behaviour.
- **Non-linear interactions** – there is asymmetry between input and output, and small events can produce significant results.

As indicated by Salmon *et al.* (2012), complex systems are epitomized by conflict and change, are highly dynamic, and forever evolving unpredictably. Furthermore, according to Vicente (1997) and Carayon (2006), STS's are intricately complex with challenges across the vast number of interactions and numerous conceptual levels. Thus, authors such as Thatcher *et al.* (2018) note that HFE should place greater emphasis on systems and complexity as compared to an earlier historical focus on micro-ergonomics.

As the nature of work systems is that they are highly complex, the conceptualization of social and technological components is paramount. A useful model to represent the socio-technical system construct is that of the general work system model. The model was initially developed by Smith &

Carayon-Sainfort (1989) and popularized within the healthcare sector by Carayon and Colleagues in 2006 as the systems engineering initiative for patient safety (SEIPS) model. The complexity inherent to human-centred work-related systems and the diversity of factors that influence how work is performed are represented in Figure 1 below.

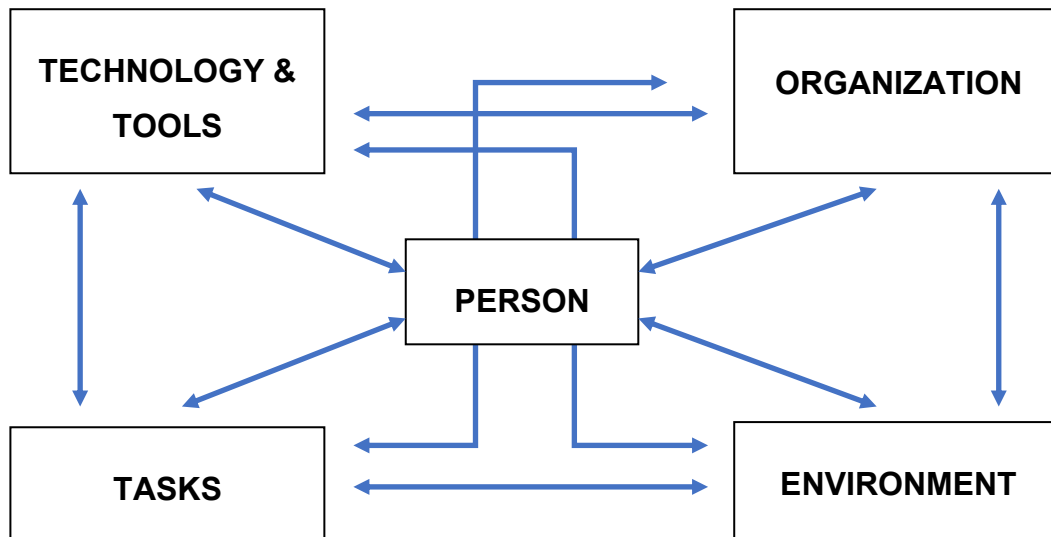


Figure 1: General work system model (Carayon *et al.*, 2006).

The human is at the centre of the work system, with a task(s) that needs to be performed, the technology or tools associated with the task, the organizational flow of the work system, and the broader environmental considerations. This conception is underpinned by balance theory (Carayon, 2009), where the entire work system needs to be balanced so that the overall impact on the individual is optimal performance, low job stress, good health, and high safety and well-being. The work system model has since been expanded upon (Holden *et al.*, 2013 & Carayon *et al.*, 2020) and is a starting point to represent the socio-technical system and begin to engage with inherent complexity.

A crucial point that is shown in Figure 1 is the importance of interactions. These components of the work system are continually interacting with each other, developing emergent properties (Bergström & Dekker, 2014; Wilson, 2014). This is further supported by the IEA definition of ergonomics, with understanding interactions as a significant focus. Thus, a model such as the general work system model is useful; however, it will never truly

represent the complex and dynamic nature of human-related systems. HFE, therefore, utilizes socio-technical systems theory as its foundation (Clegg, 2000; Walker *et al.*, 2008; Davis *et al.*, 2014; Read, Salmon, & Lenné, 2016; Salmon *et al.*, 2017), with models such as the general work system model (Carayon *et al.*, 2006), used to engage with human-centred work systems.

Role of Human Factors and Ergonomics

Over recent decades many prominent human factors and ergonomics (HFE) specialists have emphasised the need for HFE to contribute to tackling the complex systemic social and environmental problems facing humanity (Wisner, 1985; Nickerson, 1992; Moray, 1995; Helander, 1997; Salmon, Walker, *et al.*, 2017; Thatcher *et al.*, 2018). These are often referred to as “Wicked problems” such as anthropogenic climate change, plastic accumulation in our oceans, or the asymmetries in global working conditions (Lange-Morales *et al.*, 2014; Thatcher *et al.*, 2018). As described by Thatcher *et al.* (2018), these issues typically span a large geographical area and have numerous stakeholders contributing to the problem, while these same stakeholders are necessary for their resolution. A fundamental issue with these problems is the lack of central authorities coordinating the efforts to engage with solutions. Additionally, due to the complexity of these challenges, they are often very difficult to define because they are continuously evolving new characteristics.

To engage with such issues, a core focus of HFE is the concept of sustainability, defined as the management of scarce resources for both current and future generations (Lange-Morales *et al.*, 2014; Thatcher *et al.*, 2019). Consequently, to ensure the effective design and sustainability of complex socio-technical systems (Clegg, 2000), the values of HFE are of paramount importance (Wilkin, 2010; Dekker *et al.*, 2013). Lange-Morales *et al.* (2014) categorize ethical responsibility of HFE practitioners and researchers in two directions: environmental/ecospheric accountability and social responsibility. This is further expanded to values of respect for the earth, human rights, ethical decision making, diversity, and transparency

and openness. Additionally, concerning socio-technical system theory, Read, Salmon, Goode, & Lenné (2018) notes the following values:

- Humans as assets
- Technology as a tool to assist humans
- Promote quality of life
- Respect for individual differences
- Responsibility to all stakeholders

These values provide a useful, ethical framework for the discipline of HFE and socio-technical system optimization. In applying or embodying these values, it is necessary to frame them within the broader philosophical approaches of the discipline. For this thesis, there are two major approaches or distinctions; Anglo-Saxon and Francophone. The purpose of distinguishing these approaches is not to critically review but rather to acknowledge the two significant ways in which these values could be applied within the discipline of HFE. The importance of this originates, in part, from discussions by Desnoyers (2004) and Hignett & Wilson (2004a,b). Furthermore, both approaches have essential considerations for the current thesis and how the research could potentially be conducted.

Approaches to HFE Application

While there is no single body of knowledge and methodology that can be referred to as “Anglo-Saxon” ergonomics, for the current thesis, the Anglo-Saxon approach refers to what has been previously discussed within this review of literature. For instance, the traditional Anglo-Saxon approach emphasizes the domains of specialization, with a shift and focus towards systems thinking (Helander, 1997; Wilson, 2014). This includes the importance of systems ergonomics and the adoption of socio-technical systems theory (Dul *et al.*, 2012; Wilson, 2012). A recent example of the Anglo-Saxon approach is the conceptualization of the sustainable system of systems (SSoS), developed by Thatcher & Yeow (2016). The authors use Wilson’s (2014) terms to describe the elements of the nested hierarchy of complexity with the “target” system (the initial, specific system of concern)

interacting with “sibling” systems (i.e., systems with equivalent complexity and spatial influence), “parent” systems (i.e., systems that are of greater complexity or spatial reach), and “child” systems (i.e., systems that are less complex and have a tighter spatial reach).

The Francophone Activity Centred Ergonomics (FACE) approach, on the other hand, is deeply embedded in a long history of practical studies based on Vygotskian activity analysis theory. Since the 1950s, FACE approaches have been centred on real work and real activity issues, which made them different from traditional human factors’ methods (Thatcher *et al.*, 2019). This approach developed not only in Russia but also predominantly in French-speaking countries with French-speaking ergonomics (particularly in South America and Asia) emphasizing that reference to activity is at the heart of the professional approach of ergonomists (Davy *et al.*, 2018).

Although these different communities have constructed activity-oriented perspectives that do not coincide on all points, they share several characteristics. This consolidation of the Francophone approach is taken from Daniellou & Rabardel (2005): For instance, activity is object-oriented, facilitated by technical devices, psychological schemes and organisation. Furthermore, these activity mediators are socially and culturally constructed as well as historically positioned. As a result, activity is always unique and specific to given people in a given context. A significant underpinning of this approach is that the analyst’s approach to activity is intrinsic: he/she seeks to understand “from within” how the subject constructs his/her activity to attain the objective given the resources and constraints at his/her disposal. The activity approach cannot be based purely on the observation of behaviour; it requires an interaction between the analyst and the subject. Importantly, the essence of the FACE approach is the acknowledgement of the contextual nature of activity and advocacy against hypothetico-deductive processes (Desnoyers, 2004).

While these approaches have often been viewed as separate, there are several commonalities between the Anglo-Saxon and Francophone approaches. For instance, Alain Wisner wrote a series of reports about developing nations and the transfer of technology (Wisner, 1985). What is

important was the proposed shift in ergonomics, a systems approach that went beyond the traditional approach that was common at the time (Moray, 1995). Wisner discussed the need to consider cultural differences, local knowledge and geography, cross-cultural anthropometrics and cross-cultural psychology. He called for the integration of many disciplines, not just the application of ergonomics, but co-operation with psychology, sociology, and anthropology, with engineering, economics and financing, and even politics. This has distinct commonalities with the evolution of the systems ergonomics approach, notably with the importance of context within HFE application literature (Wilson, 2014) and the acknowledged importance of transdisciplinarity (Thatcher *et al.*, 2018).

Furthermore, both approaches highlight emergence as a natural property of complex systems, while FACE is open to complex, systemic, and multi-level approaches consistent with Anglo-Saxon ergonomics (Thatcher *et al.*, 2019). An important consideration is the difference between the “task” as prescribed (usually as imagined by management or designers) and the real activity (e.g., work as actually performed by the worker). This is articulated by both Daniellou (2005) within the Francophone literature and Holnagel (2016) within Anglo-Saxon, respectively.

The current investigation, therefore, argues that there is much in common between the Francophone and Anglo-Saxon perspectives. It could even be suggested that the Anglo-Saxon approach has repackaged some fundamental aspects of the Francophone approach within its more recent methodological frameworks. For instance, the perspectives approach to work as noted by Holnagel *et al.* (2016), is consistent with epistemology and methodological origins in research carried out in France in the 1960’s. The conception that work can be viewed from differing perspectives, such as the from those who prescribe it, to those who research it, and those that perform it at the sharp end.

Fundamentally, both the situated approach within FACE and systems HFE, such as SSoS, build on the underlying assumptions of the post-positivist, complex system and aim to understand socio-technical systems through embracing complexity and emergence through an embedded approach.

Philosophically, therefore it is apparent that regardless of the historical background, HFE now advocates for researchers to be embedded within the system of interest. As a result, aspects of both approaches have been adopted to engage with the context of investigation: Football in South Africa. As Thatcher *et al.* (2019) states, the dialogue is not complete on the topic of these approaches and their potential integration. The current study, therefore, merely aims to continue the conversation.

Fundamentals of Systems HFE Application

To this point, the current review has described the background of HFE and the importance of socio-technical systems theory. Furthermore, it suggests that the two predominant approaches to modern HFE application are compatible. What has been highlighted is the systems focused nature of the discipline. Importantly, several prominent researchers have advocated for this systems HFE perspective such as Rasmussen (1997), Carayon (2006), Wilson (2014) and Salmon *et al.* (2017). It is, therefore, necessary to discuss relevant theoretical and methodological considerations for the analysis of socio-technical systems from this perspective.

The origins of systems ergonomics are typically associated with Singleton (1967), who noted the changing landscape of ergonomics at the time. As the area of study grew, authors such as Chapanis (1996), Rasmussen (1997), Ottino (2003), Siemieniuch & Sinclair (2006), Hendrick (2008) & Waterson (2009) engaged with the application of ergonomics to systems. They reported lessons and considerations for researchers and practitioners alike.

Highly influential to both the discipline and the current study is the work of a prominent researcher in the field, Prof. John Wilson. He notably established the fundamentals of systems ergonomics within his 2012 and 2014 papers on the subject. Within Wilson (2014), six fundamental notions for effective systems HFE application are presented. These notions are useful in defining the philosophy associated with systems HFE application (Table 1). Additionally, the notions are essential to the research approach

framework of the current study and were highly influential in project and problem development. Each notion is, therefore, discussed in detail below.

Table 1: Table to show the six notions of successful HFE systems theory application, as noted by Wilson (2014).

<u>Notion</u>	<u>Characteristics of the notion</u>
1. Systems focus	Recognition of the area of focus as a system and providing clear boundaries
2. Holism	Recognition that systems should be seen as a whole
3. Context	Recognition that performance happens and should be understood in context, typically within a complex socio-technical context.
4. Interactions	Recognition of interactions between system parts (human-machine, socio-technical, joint cognitive systems, etc.). Recognizes the interactions between human, technical, information, social, political, economic, and organizational components.
5. Emergence	Recognition of the emergent properties of systems, including those of the human component.
6. Embedding	Importance of authentic engagement with the context

The first notion, though somewhat obvious, is that the focus of interest is treated as a system. The socio-technical system model specifies interactions across multiple levels, from a micro to a macro perspective. Wilson notes the challenges when dealing with such complexity. A useful framework is the conceptualisation of a “system of systems” (Stasinoupolos *et al.*, 2013; Thatcher & Yeow, 2016). The focal system of an academic lecture has sibling systems in the form of tutoring programs, practical’s and assessments that assist in the overall purpose of education. These are further influenced by parent systems such as institutions and

governmental policy. Importantly, Wilson does note that the idea of a “system of systems” still does not sufficiently capture the integrated reality and complexity of child-parent socio-technical systems. For useful analysis, researchers should take a broad perspective to reduce the impact of unidentified emergent characteristics that affect system resilience (Leveson, 2004).

The second notion of Wilson is the importance of context (Kirwan, 2000; Theberge & Neumann, 2010). All work, all human-related interactions, occur within a unique context or setting. Natural, social, political, and economic factors, therefore, play a fundamental role in shaping socio-technical systems. Context is imperative to the FACE approach, which highlights the vital importance of understanding the contextual nature of activity (Daniellou, 2005; Thatcher *et al.*, 2019). As interactions are present across numerous levels, systematic representation of these levels is vital to denote boundaries within an analysis. By ensuring the demarcation of parent and sibling systems, the scope of investigation can be identified (Thatcher & Yeow, 2016).

According to Wilson, there are no clear rules to define the system boundaries of the focal system. The best guideline is that setting the boundary should be useful for the analysis. Wilson continues to highlight that HFE should primarily be conducted “in the wild.” Laboratory studies often fail to replicate the complexity of socio-technical systems due to their reductionist framework. That is not to say that laboratory studies are not highly useful in areas of ethical concern. However, truly engaging with the context is vital due to its impact on both the social and technical components of the system (Moray, 1995 & 2000). As the current investigation is a case study, the importance of context will be expanded upon in due course.

The third notion is the concept of interactions. The very nature of socio-technical systems is that they have components that are continually interacting. Wilson (2000) notes that the most useful HFE applications have a focus on interactions rather than the components themselves (Ottino, 2003 & Carayon *et al.*, 2006). HFE practitioners aim to optimise the

interactions through the integration of human, technical, information, social, political, economic, and organisational components. By designing for these interactions, the resilience of socio-technical systems is increased. Resilience is an organization's ability to retain or recover rapidly to a stable condition (Wreathall, 2006), or the ability to manage great pressure as well as conflicts between safety and production objectives (Hollnagel, Woods, & Leveson, 2006). Thus, resilience is related to HFE dual optimization and increased functionality of the socio-technical system.

This is not without its challenges. Modern socio-technical systems are typically highly complex and dynamic, with unpredictability their natural state (Carayon *et al.*, 2015). Flach (2012) and Hollnagel (2012) provide interesting discussions of complexity from this perspective. Importantly, a poor understanding of the factors that interact (and the nature of these interactions) within a system may result in reduced system functionality (Leveson, 2004; Salmon *et al.*, 2017). Thus, understanding interactions is of paramount importance to the analysis of complex systems.

A relevant theoretical consideration to the current study is the conceptualised of the system within Rasmussen's risk management framework (Rasmussen, 1997). As noted by Salmon and colleagues (2017), for the system to function safely, vertical integration across stakeholders is required. Decisions at higher levels of the system should propagate down the hierarchy and be reflected in the decisions and actions at the lower levels.

Similarly, information about the current functionality should propagate up the hierarchy and inform the decisions and actions at higher levels (Rasmussen, 1997). These interdependencies across levels of the hierarchy are critical to the successful functioning of the system as a whole. The lack of vertical integration is frequently caused, in part, by a lack of feedback across levels of a complex socio-technical system (Cassano-Piche *et al.*, 2009). Actors at each level cannot see how their decisions interact with those made by actors at other levels. Fundamentally, complex systems theory from HFE places great focus on interactions due to the distinct impact on emergent properties and the dynamic nature of the socio-

technical system. HFE systems theory practitioners should be flexible, attempting to predict these emergent characteristics to increase system resilience.

The fourth notion outlined by Wilson (2014), is consistent with the constructs presented so far. The concept of Holism is that the system should be viewed as a whole, which has been noted previously within the socio-technical systems theory section. In reference to the human, HFE practitioners aim to understand the physical, cognitive, social, and emotional characteristics, to enhance or optimize their interactions with artefacts, information, environments and other people (Karwowski, 2005). For convenience, the traditional view of HFE is that it can be compartmentalized, subdivided into areas of specialization (Wilson, 2014). However, this is dangerous as it fails to engage with the broader system whole, the sum of its parts (Salmon *et al.*, 2017).

Being holistic means that when engaging with complex socio-technical systems, design or redesign changes that meet a specific aim should be specified to advance overall system resilience and efficiency (Leveson *et al.*, 2006). As such, recommendations based on analysis should also be systemic and holistic in its approach to system (re)design. The importance of holism has been noted in areas such as health care (Costella *et al.*, 2009; Carmeli *et al.*, 2013; Bergström & Dekker, 2014) and recently within the application of systems HFE to football (Salmon & McLean, 2020).

The fifth significant feature of systems HFE application is the recognition and appreciation of emergence. Emergence is a result of a complex set of non-linear interactions between all the elements comprising the system (Dekker *et al.*, 2013). This is particularly important for human components, with high levels of unpredictability in decision making and action. Emergence is, therefore, a crucial consideration within both the Anglo-Saxon and Francophone approaches to HFE (Thatcher *et al.*, 2019), as socio-technical systems involve real users under constraints such as time, space, management pressures, and motivation.

Wilson describes emergence predominantly in relation to design, as emergent properties found in practice portray the reality of work often not considered by theoretical designers. Hollnagel (2014) further proposes that design should perhaps be understood as the activity or process of designing rather than design as a product or outcome. In handling poor system design, operators find ways to make the system work despite its shortcomings. Workers, therefore, may behave in unpredictable ways that are beneficial to overall system performance, although this may not be understood from the outside (Hollnagel, 2016). Consequently, fitting the system to the user rather than the other way around, is fundamental to successful systems theory application (Dul *et al.*, 2012). Emergence, by its very nature, is unpredictable. The HFE practitioner must, therefore, be flexible and adaptable to such dynamic changes to ensure sufficient system resilience and optimized equifinality.

The 6th and final notion of Wilson is that of embedding, which discusses the way HFE practitioners carry out their work. Embedding typically refers to the entrenching of HFE practitioners within the working context. Importantly, it acknowledges that workers perform tasks with varying degrees of freedom, which enable them to adopt different paths of behaviour or task sequencing (Hollnagel *et al.*, 2015). Through embedding, these behaviours can be identified and often introduced to the work system to produce optimal outcomes while remaining within those boundaries of acceptable performance (Naikar *et al.*, 2005). Interestingly, Wilson describes an observational role for embedding, while FACE approaches emphasize that researchers are intrinsically involved with practitioners and related activity (Wisner, 1995).

The conceptualization of intrinsic involvement in activity is crucial to the current study and will be expanded upon in due course. What is highlighted by Wilson is that to engage with the complexity of socio-technical systems, researchers must embed themselves or go “into the wild” to identify emergent properties and interactions of a given system. Access to accurate, reliable, and realistic information on how the system functions is paramount to effective system design and redesign.

Wilson's six notions provide a useful philosophical approach to effective systems HFE application and STS analysis (Read, Salmon, Lenné, & Jenkins, 2015 & Davy, Weaver, Todd, & Paphitis, 2019). In our view, Wilson's notions essentially typify the modern Anglo-Saxon approach to HFE. As previously argued, there are distinct commonalities with the FACE approach, particularly in reference to acknowledging emergence and inherent complexity. Thus, although Wilson's notions provide a framework for the current investigation, some relevant characteristics of the Francophone approach have been acknowledged and included.

What is evident is that comprehensive analysis, such as that promoted within this review, reduces the impact of unforeseen factors and emergent characteristics that influence system design and redesign. Rasmussen (1997) highlights that instead of trying to control human behaviour by "fighting deviations" from prescribed working tasks, human behaviour should be managed by making these boundaries "explicit and known" and develop individual skills to cope at these boundaries. HFE systems application is therefore epitomized by comprehensive, holistic, systematic analysis, considering components, interactions and emergence, gaining insight into the system through embedding. As previously mentioned, HFE is potentially well placed to tackle complex societal issues (Thatcher *et al.*, 2018). An important consideration is, therefore, the methodology to engage with a unique context.

Participatory Research

The problem of experimental approaches to research, typified in the successful randomised control trial, are the significant limitations of these approaches in the context of complex open systems (Cartwright & Munro, 2010). System complexity implies unstable relations between all system elements and that there are often new behaviours from the interaction of system elements, which are susceptible to preconditions (Skyttner, 2005). There is, therefore, a need to study entire systems in real life (Wilson, 2012). This approach is contrary to traditional reductionist perspectives to

studying problems, which, according to Collin (1998), Wilkin (2010) and Wilson (2014), has its practical limitations.

Traditionally, the problem of interventions often lies in the uptake and application of related knowledge (Wilkin, 2010). Discrepancies between contextual and decontextual knowledge are vital to the success of any intervention. The knowledge exchange that occurs when collaborating with stakeholders yields a “co-creation” of new knowledge for both parties that can serve both innovation and scientific objectives (Gustavsen, 2003; Young, 2006). The positivistic approach may still be helpful for certain parts of the implementation problem. Still, it is facing its limits (Ryan, 2006), and reviews of ergonomics interventions have identified a decreased likelihood of program success with increasing rigour of the evaluation approach (Volinn, 1999; Neumann, Dixon, & Ekman, 2012; Neumann & Village, 2012).

Keeping in mind the need for collaboration and contextual knowledge, there has been a drive for a different approach to research engagement (Van Riet & Boettiger, 2009). This is the employment of action research, as a participatory model, involving stakeholders in problem and solution development. According to Village, Greig, Salustri, Zolfaghari, & Neumann (2014), participatory action research (PAR) is a method where researchers work with organisations to solve real-world problems by influencing solution development from an embedded position in the organisation.

The framework essentially suggests that research integration is unlike a planned intervention since it must be moulded to suit the organisation, its design processes, and the political and cultural context. This has distinct similarities to the FACE approach discussed previously. The researcher is intrinsically involved with activity and seeks to understand “from within” (Daniellou, 2005). The activity approach cannot be based purely on the observation of behaviour; it requires an interaction between the analyst and the subject. And this is consistent with the PAR approach.

From a research paradigm, this incites specific issues. Academic integrity of PAR studies depends on both the capability of solving practical problems and, at the same time, scrutinising the experiences from the field

collaboration to communicate the research findings (Levin, 2012). According to Levin (2012), this is particularly difficult as it requires mastering relevant and significant scientific technical knowledge, knowing how to run participative processes, commanding strategic and political skills, as well as being capable of reflecting on ethical and moral challenges in the research process. However, multiple authors and researchers alike intimate that PAR is well-positioned to develop grounded theory approaches from such data (Bamford & Forrester, 2003; Dick, Stringer, & Huxham, 2009; Poonamallee, 2009; Levin, 2012; Village, Greig, Salustri, Zolfaghari, & Neumann, 2014).

In PAR, the researcher may take on a variety of roles, depending on circumstances (Levin, 2012). The researcher is seen as an active participant “within” the intervention (rather than collecting data “about” the intervention). Since the bias and experience of the researcher are relevant to the qualitative interpretation of the data, researcher disclosure is fundamental when communicating findings (Fisher & Phelps, 2006). Importantly, Ottosson (2003) and Ottosson & Björk (2004) suggest that PAR is more demanding and complex than classical research in terms of time, resources, and skills, and experience of the researcher.

According to Burgess-Limerick (2018), participatory ergonomics (PE) actively involves workers in developing and implementing workplace changes which will improve productivity and reduce risks to safety and health. This methodological approach is well established with Wilson (1995) stating that the “involvement of people in planning and controlling a significant amount of their work activities” is vital to the sustainability of workplace adjustments.

The underpinning assumptions are that: workers are the experts; and, given appropriate knowledge, skills, tools, facilitation, resources and encouragement, they are best placed to identify and analyse problems and to develop and implement solutions (Stanton, Hedge, Brookhuis, Salas, & Hendrick, 2005). There are many types of participation, including consultative or representative participation, in which users or elected representatives respectively express ideas or opinions (Wilson, 1991).

Burgess-Limerick (2018) notes the importance of direct participation in which workers have some degree of influence over the decisions regarding workplace changes.

There are significant benefits to PAR and PE, as by working directly with relevant stakeholders in an open way, without pre-conceived solution programs, researchers shift from a hypothesis-testing question of “Does approach X work?” to a more experiential-learning approach asking “what elements contribute to the application of ergonomics in this particular case” (Neumann & Village, 2012). Furthermore, Chung & Shorrock (2011) argue for the need to understand better the uptake and application of scientific knowledge in organisational contexts. They suggest that such approaches (in which researchers work collaboratively with stakeholders) can assist researchers in understanding and overcoming the research-practice gap.

Rivilis *et al.* (2008) and Cole *et al.* (2009) note that experiences with PE interventions in industrialised nations have shown limited success. There are distinct challenges, such as the need for resources and time, which make effective PE or PAR challenging. Furthermore, while some PE work has been conducted in developing countries (Kogi, 2006), Cole *et al.* (2009) do comment that more research is required to engage with the effectiveness of PAR approaches. As minimal research that has applied participatory ergonomics approaches within the South African context has been conducted, there is scope to assess its efficacy.

The integrated, holistic approach of systems HFE, combined with the participatory ergonomics approach, may, therefore, provide an effective platform to engage with context-specific complex STS. A vital consideration within participatory ergonomics, and both modern Anglo-Saxon and Francophone approaches to HFE application, is the importance of contextual knowledge. The following section will, therefore, describe the context of the current investigation and the platform for problem development.

Study Contextualization

Introduction

As described by Kirwan (2000), Wilson (2000), Daniellou (2005), Theberge & Neumann (2010), Wilson (2014) and Stanton & Harvey (2017), context is a crucial consideration when undertaking socio-technical system analyses. Context is inherently multifaceted, described, and defined across several different system levels. For example, context can refer to the home, community, education, political, socio-economic characteristics of the society that the system resides (Wilson, 2014). Additionally, context is often associated with the environment or the circumstance related to a system. From an ecological and natural resource perspective, this may refer to how the environment influences the abundance and availability of a given resource (Allen & Hoekstra, 1994). A socio-technical system will, therefore, have particular aims or purposes that must be achieved, which are constrained or enabled by access to given resources. For example, a worker requires specific skills to perform a work-related task. These are dependent on their cognitive development during the formative years, access to education, training, and other influences of the community or social environment (Conger *et al.*, 2010; Blums *et al.*, 2017).

As HFE takes a human-centred approach, it is sensible to engage with factors that influence human capability in the socio-technical system (Karwowski, 2005). An example of this is the diversity in socio-economic and political elements of different population groups (Moray, 2000). These factors have important implications for health (Evans & Kantrowitz, 2002; Gallo & Matthews, 2003), personality (Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007), social cohesion (Hulse & Stone, 2007; Walpole & Wilder, 2008) and ecology (Holling, 2001) to name a few. In essence, human beings exist within highly complex and intricate contexts, with factors constantly interacting, which affect performance and health (Wilson, 2014). To understand the perspectives of how and why human-centred systems exist, it is necessary to unpack the unique characteristics of the context under investigation.

Furthermore, the selection of HFE based system methods must consider the purpose and meaning of the assessment (Rasmussen, 1997). Thus, the following section will describe the context of the current research beginning with the importance of sport and physical activity, strategies for talent identification and development (TID), the context of South African football and its related structures, as well as relevant South African football research. It will then describe the context of the Makana Municipality, Sarah Baartman District, Eastern Cape, illustrating the essential characteristics of the associated research group.

Sport and Physical Activity

Sport is fundamental to the post-apartheid era of South African society. As noted by legendary president Nelson Mandela, the power of sport is unique in its impact on social cohesion, transformation, and reconciliation. Events such as the rugby world cup in 1995 and the football world cup in 2010 highlight a country obsessed with a variety of sporting codes (Cornelissen & Swart, 2006; Cornelissen, 2007). A fundamental role of sport is the promotion of participation in physical activity at a grassroots or community level (Rosso & McGrath, 2017). Numerous studies (Eime *et al.*, 2013; Herrington & Brussoni, 2015; Donnelly *et al.*, 2016) have shown that involvement in physical activity can result in many advantages, including physical, psycho-social, and educational benefits.

Physical benefits include improved body composition, cardiovascular fitness, and long-term health (Humphreys, McLeod, & Ruseski, 2014). From a psycho-social perspective, well-designed programs are associated with improved self-esteem and self-concept as well as confidence (Lubans *et al.*, 2016). Other positive effects include enhanced life skills and peer relationships. Lastly, those involved in physical activity at a youth level have been shown to have better academic achievements and higher pass rates (Donnelly, Hillman, Greene, Hansen, Gibson, Sullivan & Herrmann, 2017). It is therefore clear that sporting participation is a vitally important component of youth development and long-term healthy living in general. This is especially important in the sport of football, with the Federation

Internationale de Football (FIFA) reporting over 265 million players actively involved in the game worldwide.

Talent Identification and Development in Football

An important consideration of sporting participation at a youth level is the identification of future talent (Williams & Reilly, 2000). Events such as the FIFA world cup, with significant financial incentives, encourage governing bodies to identify and develop talented players to contribute to a nation's success (Bennett *et al.*, 2019). Thus, Talent Identification and Development (TID) is an important research objective within the academic football community (Sarmiento *et al.*, 2018).

Recently there has been a call for a fundamental change in the conception of TID (Toohey *et al.*, 2018). Rongen, McKenna, Cobley, & Till (2018) contended that due to the resource-intensive nature (in particular the financial resources required) of such programs, they are under pressure to translate investment into elite athletes. This pressure often results in an unbalanced focus on high-level performance rather than holistic development. Consequently, researchers have started to question both the effectiveness of traditional talent identification programs and the wellbeing of participating athletes in terms of both psychological impact and injury risk (Rongen *et al.*, 2018). They conclude by advocating for a shift away from a focus on the development of elite athletes to a broader objective of supporting participation in sport and the essential benefits already highlighted.

Interestingly, Martindale, Collins, & Daubney (2005) and Martindale, Collins, & Abraham (2007) note that five vital generic features emerge consistently in successful TID programs. These include long-term aims and methods; wide-ranging coherent messages and support; emphasis on appropriate development rather than early selection; individualized and ongoing development; and finally, integrated, holistic, and systematic development. There is a need for a shift from identification to broad-based participation of youth in a variety of physical and sporting activities (Myer *et al.*, 2015 & 2016). The identification of talent would be a potential benefit

at a later stage in the life cycle of the program (i.e., talented athletes will naturally emerge from within the system). In South Africa, developing sustainable and adequate physical activity platforms that encourage mass participation is a national priority (Uys *et al.*, 2016). According to Alegi (2007), football is the most popular sport in South Africa and therefore plays a crucial role in physical activity opportunities for community members. It is, therefore, relevant to investigate football governance and structure in South Africa.

Football in South Africa

In South Africa, the most popular sport is football, with nearly 5 million players at various levels (SAFA Technical Masterplan, 2012). The national governing body is the South African Football Association (SAFA), which was founded on 8 December 1991. Before this, several different organizations existed due to racial segregation, including the South African Indian Football Association (SAIFA), South African Bantu Football Association (SABFA), and South African Coloured Football Association (SACFA) existing since 1933. In 1951 these bodies formed the anti-apartheid South African Soccer Federation (SASF). Consequently, the Fédération Internationale de Football Association (FIFA) officially recognised the white body of the Football Association of South Africa (FASA) as the sole governing body of football in South Africa in 1958. Once processes for the dismantling of apartheid were set in motion, the four historically separate football bodies came together in Johannesburg to form the South African Football Association (SAFA) on 8 December 1991. In the short space of six years, SAFA achieved remarkable success with qualification for the World Cup finals in France in 1998, the title of African champions at the 1996 African Nations Cup championships, which the country hosted, and the runners-up berth in Burkina Faso two years later. As a result, there is great pride in the institution of football in South Africa (Alegi, 2007), encouraging participation at many playing levels (Fuller *et al.*, 2010; Ogunniyi, 2015).

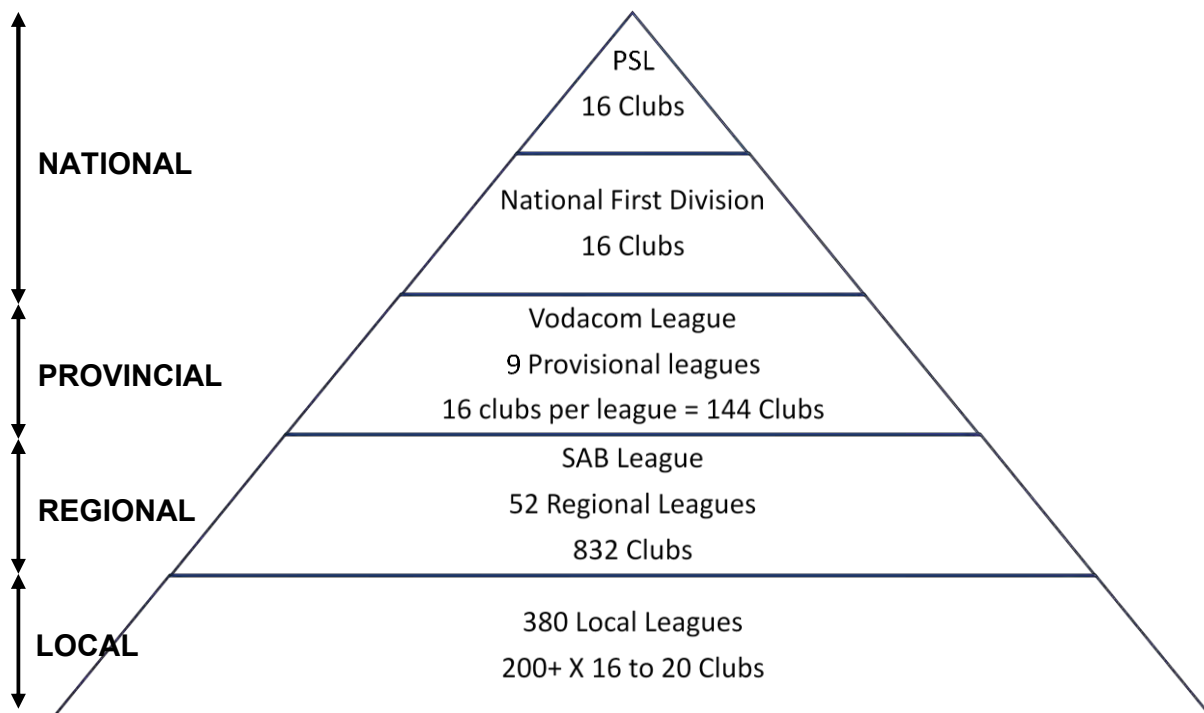


Figure 2: League structures as defined by the SAFA Technical Masterplan (2012)

To gain perspective on the structure of SAFA, Figure 2 above represents the structure of the associated leagues. These are designed as a pyramid moving from the local level to the national level (SAFA Technical Masterplan, 2012). The top two divisions within South Africa are comprised of professional franchises. A total of 16 teams in each division from around the country participate. The 3rd division is provincially based with nine leagues, each consisting of 16 teams per league. This division is predominantly semi-professional. Regional leagues populate the 4th tier of South African football, in which a total of 832 teams countrywide compete at an amateur level. Finally, according to the SAFA Technical Master Plan (2012), there are 380 Local Football Association (LFA) leagues in South Africa, with clubs within each LFA ensuring representation at Under 13, 15, 17, and open levels. The LFAs form the basis of the SAFA talent identification and development program and the point for vertical migration of players to higher league structures (SAFA Annual Activity Report, 2018). Consequently, the LFA structure plays a pivotal role in talent development and consists of the largest pool of players within South Africa. Considering

the fundamental purpose of the LFA in meeting the central aims of TID in South Africa, it is relevant to investigate football-related research in the South Africa context. This will inform what we know about football in South Africa, the approach to TID, and the relation between research and practice in this context.

Football related research in South Africa

The global popularity of football, coupled with the professionalization of the sport, has resulted in a large body of scientific knowledge. Literature has been established across several different domains, including sports science (Reilly & Gilbourne, 2003), management (Crust & Lawrence, 2006), political science (Schatzberg, 2018), psychology (Gledhill *et al.*, 2017), and sociology (Pfister, 2015). As previously argued, an important consideration in terms of the applicability of such research is diversity in context. From a sports science and performance perspective, Jones, Ryan, & Todd (2015) argued that until recently, the focus of the majority of related research was primarily on European populations. Since different populations have different physical characteristics (Gallagher *et al.*, 1997; Looker, 2002; Carroll *et al.*, 2008) and also combinations of interacting intrinsic and extrinsic characteristics (Tucker & Collins, 2012), the applicability of this research to a South African context is questionable.

For example, Yu *et al.* (2002) recognised the significant genetic diversity across the African continent, emphasising that there are more significant genetic differences between Africans than between Africans and Eurasians. Furthermore, Campbell, Hirbo, Townsend, & Tishkoff (2014) illustrated divergence and admixture across the African continent, highlighting the diversity in populations in sub-Saharan Africa. Such diversity results in differing performance characteristics (Tucker, Santos-Concejero, & Collins, 2013), across different population groups (Hamilton, 2000). From a broader sociological perspective, multiple authors (McGarry, 2009; Halldorsson, Thorlindsson, & Katovich, 2014; Bean & Forneris, 2016) have noted the importance of context specificity with regards to understanding psychosocial aspects of the sport. Socio-economic factors (Dollman &

Lewis, 2010) and political considerations (Houlihan & Zheng, 2013) such as historical oppression (Anderson & McCormack, 2010), infrastructures (Wicker *et al.*, 2009), community health (Finch & Donaldson, 2010) and ecological environment (Araújo *et al.*, 2010) further demonstrate diversity in footballing contexts. It is, therefore, evident that football-specific research requires a more nuanced understanding of the various populations.

Studies relevant to the South African football context were therefore identified and included in Table 2 below. The aim was to contextualize relevant research as opposed to critically reviewing across multiple disciplines and domains. For practical purposes, broader categories have aided the grouping of studies, demonstrating discipline-specific research. Related research was identified through a literature search on search engines such as google scholar, utilizing the following keywords: football, soccer, South Africa, research, African, Africa, sport, youth development, talent identification, and development.

Table 2: South African specific football studies published to date

Sports Science			
<u>Study Authors and date</u>	<u>Population</u>	<u>Domain of interest</u>	<u>Context</u>
Zeederberg <i>et al.</i> (1996)	Amateur	Nutrition	Western Province Caltex Colts League
Nematswerani, & Mars (2005)	Professional	Injury	u23 National Olympic Soccer Team
Durandt <i>et al.</i> (2006)	Professional	Physical characteristics	Western Cape 1 st division club players
Clark (2007)	Professional	Physical characteristics and performance	PSL Players
Balley, <i>et al.</i> (2009)	Amateur	Performance and physiological characteristics	University of Free State First Team
Rebelo, <i>et al.</i> (2010)	Professional, semi-professional and amateur	Physical characteristics	PSL, Vodacom Cup and University team players from Gauteng
(Lategan, 2011)	Referees	Physiology	National Referee Panel
Mohamed <i>et al.</i> (2012)	Elite	Injury	u23 Female National Players
Fortuin & Coopoo (2012)	Youth Amateur	Scientific support for youth football development programs	Gauteng Youth Players
Goedecke <i>et al.</i> (2013)	Amateur	Nutrition	Western Cape LFA Players
Aginsky <i>et al.</i> (2014)	Professional	Physical characteristics	Gauteng Elite Players

Calligeris, Burgess & Lambert (2015)	Professional	Injury	PSL Elite Players
Gordon, Kassier, & Biggs (2015)	Amateur	Physiology	KwaZulu Natal Disadvantaged Adolescent Players
Jones, Ryan, & Todd (2015)	Amateur	Physical characteristics	Eastern Cape University Players
Sparks, Coetzee, & Gabbett (2016)	Amateur	Physical characteristics	North West Province University First Team Players
Starzak, Konkol, & McKune (2016)	Youth	Immunology	KwaZulu Natal Disadvantaged Adolescent Players
Kubayi, Paul, Mahlangu, & Toriola (2017)	Amateur	Physical and Anthropometric Characteristics	Gauteng University Players
Management/Business			
<u>Study Authors and date</u>	<u>Focus</u>	<u>Domain of Interest</u>	<u>Context</u>
Dhurup & Mofoka (2011)	South African Football Supporters	Soccer Stadia Assessment	Gauteng Stadia
Isabirye & Surujlal (2012)	South African Football Supporters	PSL Attendance in South Africa	Gauteng Supporters
Stander, De Beer, & Stander (2016)	SA Football Supporters	Buying Behaviours	Gauteng Supporters
Political Science			
<u>Study Authors and date</u>	<u>Focus</u>	<u>Domain of Interest</u>	<u>Context</u>
Alegi (2007)	Community	Mega Stadiums and underdevelopment of grassroots football in South Africa	Western Cape Stadia
Alegi (2008)	FIFA World Cup 2010	Politics of Stadium Construction	Western Cape and KwaZulu Natal Stadia

Social Development

<u>Study Authors and date</u>	<u>Focus</u>	<u>Domain of Interest</u>	<u>Context</u>
Saavedra (2003)	Feminine Identify in Football	South African case study	National Female Football
Peacock-Villada <i>et al.</i> (2007)	South African Youth	Building HIV resiliency through sport in SA community members	Gauteng Disadvantaged Adolescent Players
Höglund & Sundberg (2008)	SA Community	Reconciliation through sport	National Sporting Programs
Burnett (2009)	SA Youth	Impact of Siyadlala participation program	Nationwide Community Based Mass participation
Fuller <i>et al.</i> (2010)	SA Community	Efficacy of football for health program	Western Cape Informal Township
Darby & Solberg (2010)	SA Professional Footballers	Impact of football on player migration	PSL Players
Clark (2011)	Female	Challenging male hegemony in South African Football	National Female Football
Swart <i>et al.</i> (2011)	Football Foundation of South Africa	Sport development and social legacy	Western Cape Infrastructure
Balfour <i>et al.</i> (2013)	SA Community	HIV prevention through Football	KwaZulu Natal Disadvantaged Adolescent Players
Whitley, Hayden, & Gould (2013)	SA Football Coaches	Efficacy of sport for development program	Western Cape Province
Hershow <i>et al.</i> (2015)	SA Community	HIV Prevention through Football	Gauteng, Western Cape Free State, Eastern province
Giampiccoli & Nauright (2019)	SA Community	Football and community development in rural South African communities	Eastern Cape Province

Psychology/Sociological

<u>Study Authors and date</u>	<u>Focus</u>	<u>Domain of Interest</u>	<u>Context</u>
Dawson-Squibb & Schomer (2004)	Elite players and coaches	Perceptions of success for players and coaches	Western Cape Province
Pelak (2005)	Female Soccer	Negotiating gender/race and class constraints in South African Football	Gauteng and Western Province
Alegi (2016)	Grassroots	Football heritage in South Africa	KwaZulu Nata Province
Bolsmann & Parker (2007)	SA Community	Impact of celebrity culture	National Football Culture
Le Roux (2007)	Sport Coaches in South Africa	Motivational strategies of coaches	Gauteng Province
Surujlal & Nguyen (2009)	SA Coaches	Sources of Stress for coaches	Nationwide Coaches
Ndimande-Hlongwa (2010)	SA Community Members	Teams and players as symbols of a multicultural country	National Football Symbols
Hill (2010)	South African culture	Historical perspective on the social diffusion of football in South Africa	National Historical Review
Steinbrink (2010)	Amateur	Role of amateur football on circular migration systems in SA	Nationwide Amateur Players
Clark & Burnett (2010)	Female Amateur	Upwards social mobility through women's football	Gauteng University Players
Clark & Burnett (2011)	Youth Amateur	Impact of football on socialization of female participants	Gauteng Province
Maseko & Surujlal (2011)	Elite	Player perception on retirement planning	PSL Players

Surujlal & Nguyen (2011)	Football coaches	Motives influencing football coaching	Gauteng Province
Jere & Mathidza (2014)	SA community	Match attendance post 2010 world cup	PSL Supporters
Kubayi (2015)	SA Football Coaches	Job-related barriers for soccer coaches in Gauteng	Gauteng Province
Ogunniyi (2015)	Female Players	Effects of sport participation on gender relations	Gauteng and Western Cape Province
Kubayi & Coopoo (2016)	SA Football Coaches	Challenges faced by sport coaches in South Africa	Gauteng Province
Kubayi, Coopoo, & Morris-Eyton, (2017)	Sports Coaches	Perceptions of female coaches in Gauteng	Gauteng Province

Firstly, from the sports science perspective, it is evident that professional players have been the primary focus of this research for both injury risk (Nematswerani, & Mars, 2005; Calligeris, Burgess & Lambert, 2015) and performance characteristics (Durandt *et al.*, 2006; Clark, 2007; Rebelo *et al.*, 2011; Aginsky *et al.*, 2014). To a lesser extent, these domains have also been studied in semi-professional and university level players (Balley *et al.*, 2009; Rebelo *et al.*, 2011; Jones *et al.*, 2015; Sparks, Coetzee, & Gabbett, 2016). At an amateur level, only three studies have been conducted investigating immunology (Starzak *et al.*, 2016) and performance characteristics (Rebelo *et al.*, 2011; Gordon, Kassier, & Biggs, 2015).

With regard to management and business studies, there was a significant boom in related research following the hosting of the 2010 FIFA world cup. Particular focus was placed on supporters with a study by Isabirye & Surujlal (2012) investigating PSL attendance figures, Stander *et al.* (2016) analysing buying behaviours of supporters, and an investigation by Dhurup & Mofoka (2011) engaging with stadia assessment and the challenges of meeting spectator expectations. Management literature shows a distinct focus on the implications of the professional game on the South African public, their attitudes to attendance, and associated expectations.

Within the domain of political science, two studies also investigated the impact of hosting the world cup on stadium constructions (Alegi, 2007) and the impact of such stadia on grassroots football development (Alegi, 2008). These studies indicate engagement with the implications of significant investment into football-related infrastructure and the impact on business-related factors. Of vital importance derived from Alegi (2007) are the resulting negative consequences for community-level football. A focus on elite performance and professional player development has severe ramifications for grassroots investment and mass participation. This has important implications for football TID programs in South Africa.

Considering the classification of South Africa as a developing nation, it is unsurprising to find significant research in the realm of social development. A significant issue within the South African community is the quadruple burden of disease (Mayosi *et al.*, 2009), particularly the prevalence of HIV.

Peacock-Villada, DeCelles, & Banda (2007), Balfour *et al.* (2013), and Hershow *et al.* (2015) have thus investigated how football can be used in the fight to prevent HIV. Health and related socio-economic factors, therefore, play a vital role in the success of grassroots sporting programs and relevant compliance. At the same time, these studies demonstrate both the power and importance of prioritizing community-based physical activity platforms.

Interestingly, two additional papers have looked at the difficulties for female footballers in South Africa, breaking into a male-dominated arena (Saavedra, 2003; Clark & Burnett, 2011). This may be indicative of a more inclusive approach to South African football and engagement with the historical discrimination of the South African football context (Ndimande-Hlongwa, 2010). In terms of the general benefits of football to the South African community, Burnett (2009) analysed the effectiveness of the nationwide Siyadlala (let's play!) initiative implemented by local government. Considering the positive impact on health (Fuller *et al.*, 2010) and the vital role such programs play in combatting poverty in South African (Whitley, Hayden, & Gould, 2013), this is an important research area.

Additionally, due to South Africa's turbulent past, the importance of football to reconciliation and national social climate has also been a focus of researchers (Höglund & Sundberg, 2008; Swart *et al.*, 2011). The authors identify the crucial role of football in the cohesion and transformation of South Africa's unequal society. Finally, studies by Darby & Solberg (2010) and Steinbrink (2010) have also investigated player migration, unpacking how labour opportunities impact the movement of amateur South African players.

Within the domain of both psychological and sociological based research, several studies have been conducted investigating the reality of South African football for females. The socialization of females through football has been examined by Pelak (2005), Clark & Burnett (2010), and Ogunniyi (2015), unpacking the challenges for women playing football in South Africa. Clark & Burnett (2011) further investigated the social mobility of females with regards to football and the related lack of support and infrastructure.

Finally, Kubayi *et al.* (2017) investigated the perceptions of female coaches in terms of the development of female football in South Africa. Combined with literature from social development, there is a significant increase in female-orientated research, which is highly promising considering the dearth of literature in this area.

Additional studies from the psychosocial domain have looked into several different aspects. Dawson-Squibb & Schomer (2004) established the determinants of success for elite players in South Africa through interviews with high-level players. Maseko & Surujlal (2011) also investigated the perceptions of retirement planning amongst elite players, identifying the large number of players who struggle to remain financially stable once their playing days are behind them. As football is part of the societal fabric in South Africa, the legacy and associated cultural impact have also been studied. Alegi (2016) & Hill (2010) engaged with the football heritage in South Africa and its historical importance. These demonstrate the fundamental role of football, both historically and in the modern era, has to play in the South African community. As the most popular sport, the efficiency of both grassroots and elite platforms is vital to the attitudes and motivations of South Africans. Ndimande-Hlongwa (2010) and Bolsmann & Parker (2007) further establish how elite level players and teams are cultural icons and symbols in South Africa, acting as role models and crucial to popular culture.

Finally, coaches have been a significant area of study within the South African context. A paper regarding motivational strategies of grassroots coaches (Le Roux, 2007) engages with the adaptable approaches that coaches employ in this unique context. Furthermore, the motives of such coaches (Surujlal & Nguyen, 2011) indicate what drives coaches to develop sustainable physical activity platforms. In addition, the significant stress placed on these coaches, and sources of this stress (Surujlal & Nguyen, 2009), show just how difficult it is for coaches to operate efficiently and effectively, whereas Kubayi *et al.*, in 2015, further elaborated on the job-related barriers and challenges that face South African coaches. These studies again demonstrate both the complexity of the grassroots football

context, as Kubayi *et al.* (2017) notes that coaches play numerous roles at a community level such as coach, training, fundraiser, administrator, parent, role model and in some cases, a medical expert. Such demands place a heavy burden on the foundation of grassroots football programs, the coaches.

Summary and Consolidation of South African literature

The previous section has provided an overview of South African football-related literature, grouped across several different disciplines. When combining the various characteristics identified, the domains of interest, the playing level, the literature demonstrates that there are a vast number of considerations with regards to South African football. In Figure 3 below, identified South African football research is represented within the general systems model (Smith & Carayon-Sainfort, 1989). Furthermore, additional considerations, as noted by Salmon & McLean (2020), have been included, emphasizing the vast number of interacting components within this context.

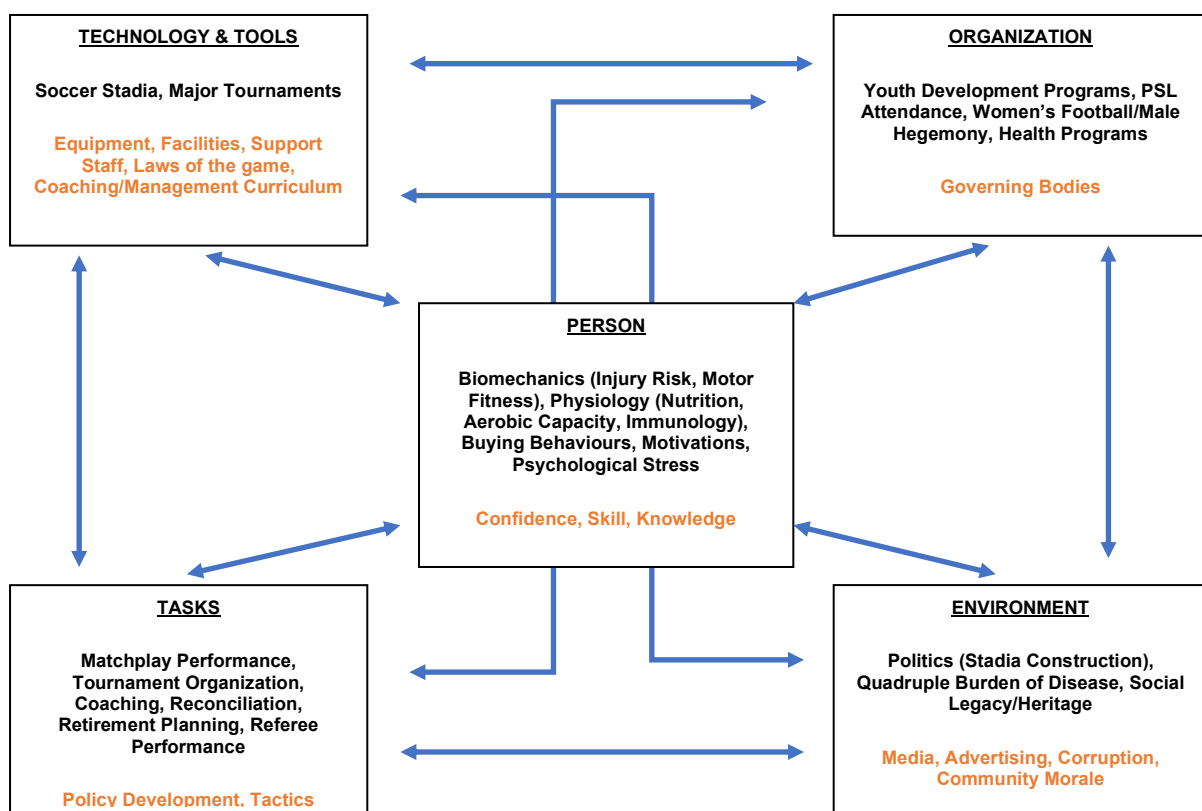


Figure 3: General work system model of South African football research. In addition, considerations identified by Salmon and Mclean (2020) are indicated in gold.

Salmon and Mclean (2020) argued for complexity in the beautiful game, referring to football and that this should be reflected in associated research. Figure 3 above supports this assertion and suggests that South African football is, therefore, highly complex and should be viewed as a sociotechnical system, which necessitates a systematic approach to related research. While it is clear that football research in South Africa has become multi-disciplinary, few studies have adopted a systems approach to understanding the South African grassroots football context. The majority of these studies have taken a reductionist paradigm approach to understand the system of interest. Within the sports science and, more specifically, the football research community, there has been a call to engage with more systemic approaches to understanding sport-related phenomena. South African sports science researchers have been slow to respond to this need, with Coopoo & Fortuin (2012) noting in the research report on the art, philosophy, and science of football in South Africa that the country suffers from a dearth of comprehensive research into football.

Furthermore, as denoted in Table 2 above, the majority of the literature has been conducted in the Gauteng and Western Cape contexts and focusing on metropolitan areas. Few studies (Peacock-Villada *et al.*, 2007; Fuller *et al.*, 2010; Balfour *et al.*, 2013; Gordon *et al.*, 2015; Starzak *et al.*, 2016) have engaged with lower income disadvantaged populations. As few studies have been conducted in such areas, and related research has not typically adopted a systemic approach, there is a need for more research that engages with the complexity of grassroots football programs from these contexts. As previously highlighted, a significant contributor to community health and wellness is the administrative structures of grassroots football programs, the Local Football Association (LFA), which form the backbone of the community level football structures of SAFA. Engaging with the organizational design of these programs and structures is vital in understanding football sporting participation and TID platforms within the South African context. Furthermore, no research has applied an HFE paradigm to such platforms within South Africa.

Initial Problem Formulation

It is evident from the above literature review that HFE is well placed to engage with complex societal issues due to its systems approach, socio-technical system values, and participatory ergonomics approach. A critical socio-technical system is that of grassroots football platforms that contribute to the health and wellness of community members in South Africa. Thus, the initial purpose was developed for the current study:

The discipline of HFE advocates for the application of systems theory as a useful conceptual framework to assess and redesign complex socio-technical systems. It further notes the importance of ergonomists engaging with wicked societal problems. For example, grassroots football talent identification and development (TID) structures in developing nations such as South Africa are influenced by significant economic/social/political factors. To date, minimal research adopting a systematic perspective has been employed within such a context. A broad starting point for the purpose of this study is, therefore, the application of HFE complex systems methodology in grassroots TID platforms in South Africa.

Case Study Context: The Eastern Cape and the Makana Municipality

As emphasized in the previous section, context is a crucial consideration to the application of Systems HFE (Daniellou, 2005; Wilson, 2012). Furthermore, authors such as Wilson (2014) & Thatcher *et al.* (2019) emphasize the importance of setting system boundaries that are useful for analysis. For the refinement of the broad research problem identified above, the current investigation was delimited to the Makana Local Football Association (LFA), serving as a case study. This will be expanded upon in due course.

The current study is based within Makhanda (formerly Grahamstown), Eastern Cape, South Africa. To understand the development of the research question, it is essential to describe the unique environment and socioeconomic context of the LFA in this municipality. The Makana

municipality is based within the Sarah Baartman district municipality in the Eastern Province of South Africa. The Eastern Cape is the poorest province in South Africa, primarily due to the poverty found in the former homelands, where subsistence agriculture predominates (Westaway, 2012).

Additionally, the Eastern Cape Department of Education has been widely criticised for poor primary and secondary education resulting from dysfunction, special interests, and issues with the South Africa teacher's union, SADTU (Gwanzura, 2009; Basopu, 2010). The province struggles with a lack of schools; a lack of teachers leading to overcrowding; a lack of textbooks; a lack of basic facilities like toilets, electricity or water; and poor transport infrastructure, which regularly absents and endangers learners (Brown & Duku, 2008; Lemon, 2004). With regards to health, Tuberculosis and HIV are the province's leading causes of avoidable deaths, accounting for 9.8% and 5.4% of those deaths (Møller & Erstad, 2007). Such characteristics of the poorest province again speak to the complexity in achieving sustainable and adequate physical activity platforms.

The Sarah Baartman municipality governs the town of Makhanda and the surrounding areas. According to South African CENSUS data from 2011, Makhanda has a population of around 80 000 people with a population density of 18/km². The main economic sectors are Government (51.5%), trade (15.6%), finance and business services (15.3%), manufacturing (7.1%), agriculture (4.4%), transport and communication (2.9%) and construction (2.1%). The majority (78%) of the population are black Africans, with the most significant language isiXhosa (71.5%). Unemployment levels of 35% is a significant issue for the Makana population, with unique challenges for the youth considering inadequate educational facilities and limited access to the labour market (Drummond & Snowball, 2019).

Furthermore, the Makana municipality has faced many significant challenges in recent years, being placed under administration in 2014 in response to financial and infrastructure crises. Additionally, the municipality has been declared a disaster zone due to drought and its inability to provide consistent water to its citizens due to a lack of maintenance and investment

in infrastructure (News24, 2019). Makana also has outstanding debt of R90 Million to Eskom, the electricity provider, and consistent threats of mass blackouts have been voiced. Importantly, the Makana municipality is not unique in its struggles and challenges across the South African landscape, particularly in the Eastern Cape. It is, therefore, representative of non – metropolitan, remote areas, which face differing challenges.

Considering the current study is investigating grassroots football in Makana, it is prudent to engage with characteristics of this football community. Whilst minimal documentation exists regarding the history of football in this municipality, several investigations from the Human Kinetics and Ergonomics Department at Rhodes University have been conducted. For instance, to describe the features of the football playing population, a study by Ryan *et al.* (currently under review) established the characteristics of a cohort of amateur players in Makana, participating at a local level. Although the sample is admittedly small, these aspects are useful in describing the context of players in Makana.

For instance, only 16% of players had medical aid or any form of health cover. The majority (90%) of the cohort's occupation was in the manual labour industry, with most participants indicating the informal and unreliable nature of employment in this sector. Furthermore, monthly income was R1647 (\$114), with typical household numbers of 5 per household. Only 15% of the cohort had any tertiary education with financial challenges cited as the primary contributor to not pursuing further education.

Furthermore, a master's level study by De Beer (2018) investigated the development of youth players, studying maturation rates and development pathways. Findings indicated poor comparative results for skill development across all age groups, while a delayed maturation rate was further reported. These findings have important ramifications for TID programs in Makana. Additionally, Potgieter (2016) and Callow (2019) conducted qualitative studies to engage with coaching skills and coaching perspectives. These investigations noted minimal coaching skills within the local community. Moreover, a lack of educational opportunities was a significant challenge for coaches, further compounding the challenges for TID in this context.

The Makana Municipality context is therefore highly complex. Effective analysis requires acknowledgement of this complexity and the vast number of interacting factors within this setting.

The Platform for Needs Identification

The current research promotes a systems HFE perspective to the analysis of complex socio-technical systems. The notions published by Wilson (2014) were an essential factor influencing the methodological approach, where he poses a fundamental question to the philosophy of research. “It is tempting to be hard-nosed and suggest that any study, investigation, analysis or development which does not take a systems view is, in fact, not E/HF at all. Rather such an initiative should be seen as a sub-set of E/HF, a biomechanical, cognitive psychology or physiology study, and possibly of limited practical value.....My own view is that systems ergonomics should be carried out “in the wild” That is, laboratory research has its place but not a primary one.” (Wilson, 2014, pg. 3). The prevalent question was, therefore, how to effectively engage with the context of grassroots TID football platforms in Makana, Eastern Cape.

Importantly, Makhanda has the tertiary institution of Rhodes University within its community. Paphitis & Kelland (2016) notes that there are existing tensions between the community and the institution. Therefore it was important to build trust with the local community (Belone *et al.*, 2016) to create a platform for needs identification of the current project. As previously noted, participatory ergonomics is well established as a useful tool to gain access and to engage with unique contexts (Burgess-Limerick, 2018; Edwards, Prætorius, & Nielsen, 2020). Furthermore, authors such as Dekker & Nyce (2004), Farrington-Darby & Wilson (2009) and Lützhöft *et al.*, 2010) emphasize that research of this nature should adopt an ethnographic approach, which considers the unique characteristics of the context. This is synonymous with the Francophone approach to ergonomics application (Daniellou, 2005).

Embedded Research

Within an HFE framework, engaging with a context is done through the process of “embedding”, as outlined by authors such as Daniellou (2005), Neumann *et al.* (2012)^{a,b} & Wilson (2014). Traditionally, embedding has been viewed as the placement of HFE experts within the organization. These are typically well structured and predominantly focus on large, private, well-resourced businesses (Wilson, 2012). This conceptualization has not been applied to sociotechnical systems such as grassroots football TID platforms. However, embedded research within community-based contexts is well established (Vindrola-Padros *et al.*, 2017). Furthermore, there are a number of benefits to this approach.

For example, embedding allows researchers to ask the “right” questions (Reiter-Theil, 2004), get unique perspectives, insights and data (Jenness, 2008), allowing researchers to engage with real problems in a real context (Hackett & Rhoten, 2011). Furthermore, insider knowledge enables the researcher to tailor the research to meet the needs of the organisation (Rowley, 2014), increasing the organisation’s capacity to inform policy and practice (Wong, 2009). These characteristics are consistent with participatory approaches to co-construction of research problems (Duran *et al.*, 2019) and the values of sociotechnical systems theory (Read *et al.*, 2018). It was, therefore, necessary to embed within the grassroots football context of Makana.

Fortunately, an opportunity presented itself through a community request. A local football club was looking for assistance with the training of its players. The researcher initially performed this consultancy individually, travelling to the local club and conducting training three times a week. As new football researchers joined the research program, the aim and direction of the research group were discussed, with these students then integrated into the strength and conditioning program of the senior first team. This involved the assessment of players, periodization of training programs, tactical and technical coaching. In return, related research would be focused on club players, developing physical profiles to understand the

development of youth players better. Priorities of embedding were to build trust and credibility within the local football community (Einfeld & Collins, 2008; Levin, 2012; Misener & Doherty, 2013; Berger, 2015) and to establish a sustainable, mutually beneficial partnership (Davy *et al.*, 2019).

Stakeholder Identification

Through this embedded community-based program, constant interactions with various stakeholders from club administrators, coaches, players, referees, funders, as well as local government offices such as the Department of Sports, Recreation, Arts and Culture (DSRAC), a cohesive picture of the interactions associated with football participation in Makana was developed. Building on the work of Wilson, the stakeholders for participation in sport in Makana have been listed in Table 3 below. These stakeholders have been categorised according to the framework laid out by Dul *et al.* (2012), describing system actors, the decision-makers, influencers, and experts. The stakeholder list emerged as a by-product of our interactions within the system.

Table 3: Stakeholders and partnerships associated with the complex systems in sport research group

<u>Stakeholder Category</u>	<u>Stakeholder</u>
<u>System Actors:</u>	Players in sports clubs, local community members, non-profit organizations, local schools
<u>System Decision-makers</u>	Makana Local Football Association administrators, referees, and coaches, South African Football Association
<u>System influencers</u>	Department of Sports, Recreation, Arts, and Culture (DSRAC), Makana Municipality, Eastern Cape Academy of Sport, Local Schools
<u>Systems experts</u>	Human Kinetics and Ergonomics Department

The stakeholders listed here are representative of football participation in the Makana municipality system. It is acknowledged that within the South African football context and within the SAFA organisational structure, there are a number of broader influential stakeholders. These include the national level where policymakers prescribed organisational structure for local football. Furthermore, the hierarchical structure includes regional and provincial committees, which also play a role in local football governance. While these additional stakeholders are important, it was not possible to access them for the current investigation. The aim of this exploratory study was to assess the usefulness of the approach at a local level, with the hope that improved access to broader stakeholders may be achieved.

Once the stakeholders were identified, it was essential to understand their roles. As illustrated previously, systems HFE is useful in engaging with complex socio-technical systems. A project within the research group, therefore, aimed to apply system modelling tools, specifically the work domain analysis of Cognitive Work Analysis, to gain insight into the complexity of a crucial stakeholder (Le Grange, 2018).

A key stakeholder for promoting participation in sport is the local government offices of DSRAC. They provide essential services to local clubs, including financial and capacity building support. Le Grange (2018) noted vast numbers of functions, activities, and processes both constrain and afford opportunities within the system. Responsibilities from sponsorship, infrastructure investment, athlete tracking and program monitoring and development place a significant load on those who work within DSRAC. A key outcome of this need's analysis was, therefore, the importance of capacity building. Access to training is limited by both location and cost, as the majority of Makana society are of low socioeconomic status. Improving access to upskilling and empowering community members to engage with the unique characteristics of their context was the fundamental approach developed through the current research group program. Furthermore, through this process, some critical aspects of local football TID were established, such as communication channels, processes and stakeholder relationships.

An Emergent Embedded Research Program

As a result of the community-based strength and conditioning program, several research projects have been completed engaging with the South African football development context. De Beer (2020) identified key physical and technical characteristics of youth footballers in Makana, noting significant deficits in skill acquisition as players often were not able to perform the tests adequately. Additionally, Potgieter (2016) established characteristics of local coaches, attitudes towards local football coaching and perceived needs for coaches in the Makana context. Her research was built on by Callow (2019), engaging with coaching practices, identifying unique context-specific barriers to effective coaching and development. A significant finding from this research study was the lack of capacity within the coaches of the local community. There was a perceived lack of opportunity and access to upskilling. Following these findings, Mia (2019) developed a technical skills guide, a no-cost low-cost method to improve skills amongst local youth players. The skills guide began to complete the loop in terms of tangible outcomes from related research that serves community needs.

Findings from the previous investigations within the research program resulted in the identification of a fundamental football stakeholder in Makana: The Makana Local Football Association (LFA), which is responsible for grassroots football organization and establishes mass participation in football at this community level. It was essential to embed within the LFA, to both create trust and credibility within the football community. Embedding was important, as noted by Giampiccoli & Nauright (2019), “understanding the hurdles faced in resource-strapped communities will enhance discussion of how sporting development can be supported rather than imposed and become sustainable in the future”(pg. 288).

Through endorsement from local club leaders, the researcher was nominated to the position of Treasurer of the Makana LFA. Over the next three years, the researcher was involved in a significant number of LFA activities from competitions organisation to financial management,

stakeholders' interactions, and conflict resolution. As an active member of the executive committee, it was possible to gain first-hand knowledge of the constraints and affordances associated with the Makana LFA system. For instance, all members serving on LFA committees are volunteers, giving their own time with no remuneration.

Through this role, relationships were developed with administrators, allowing for the gaining of empathy for the reality of administration in this context (Scott & Graham, 2015; França & Hollnagel, 2019). The purpose was to create a platform for participatory engagement with community-based problems, to develop a strategy to create sustainable solutions (Vindrola-Padros *et al.*, 2017). It is acknowledged that there are conflicts and challenges associated with this form of embedding. These will be discussed in due course.

Refined Problem Formulation

Through interactions with community leaders, it became evident that there was perceived dysfunction regarding the Makana LFA. Administrators reported significant challenges and barriers to effective administration. As a result, and through discussions with multiple stakeholders, the refined purpose of the current thesis was therefore established:

Investigate the organizational design of the Makana Local Football Association (LFA).

This refined problem is deliberately generalized to allow the evolution of the problem in accordance with participatory ergonomic approaches (Zalk, 2001; Burgess-Limerick, 2018). Consequently, a challenge for the current project was to identify methodological techniques that suit the context of the Makana LFA, considering the challenges previously discussed. It was, therefore, necessary to review Systems HFE analysis tools that allow for effective and comprehensive socio-technical system engagement.

System Mapping and HFE Complex Systems Tool Selection

HFE systems theory places focus on the importance of conceptual modelling, mainly through the use of functional abstraction to represent systems of interest (Wilson, 2014). Over the past decades, several HFE systems analysis tools have, therefore, been developed utilizing this technique (Rasmussen, 1997; Vicente, 1999; Salmon, Walker, *et al.*, 2017; Stanton & Harvey, 2017; Hulme, Thompson, *et al.*, 2019). The majority of these tools aim to map the system of interest according to a proposed hierarchy. Systems states, components, interactions, processes, activities, agents can then be graphically represented (Svedung & Rasmussen, 2002) to assist in system design and redesign.

Many of these tools find their origin in accident analysis, associated with safety management within a working context (Salmon *et al.*, 2012; Waterson *et al.*, 2017). At this point, it is important to contextualize a shift in thinking in safety management within HFE as it has had an influence on the perspectives of HFE systems analyses. Safety I has traditionally focused on root cause analysis and “freedom from unacceptable risk.” A traditional interest in actions that led to failure. However, more recently, authors such as Hollnagel, Wears, & Braithwaite (2015) have established the notion of Safety-II, in line with resilience engineering, maintaining that “things go wrong” and “things go right” for the same fundamental reasons. Safety is, therefore, the ability to succeed under varying conditions.

Improving the resilience, particularly of human actors, and cultivating increased equifinality, is vital to meet both safety and production goals. This shift in thinking has seen root cause-based tools criticised for the lack of a holistic view of system analysis and lack of engagement with normative behaviour (Reason *et al.*, 2006; Waterson *et al.*, 2015). The following section will engage with systems theory tools, demonstrating how conceptual modelling has developed in this field over the past few decades. The summary of tools can be seen in Table 4 below. The purpose is also to review the flexibility of these tools, their limitations, and their applicability to diverse contexts, such as those associated with “wicked” societal

problems (Thatcher *et al.*, 2018). This will provide a platform for tool selection in the context of Makana.

Table 4: Review of HFE systems-based tools

Name and Associated Publication(s)	Background	Application Examples	Perceived Benefits	Perceived Challenges
<p><u>Hierarchical Task Analysis (HTA)</u></p> <ul style="list-style-type: none"> Annett & Duncan (1967) Shepherd (2002) 	<p>The initial method to collect, analyse and interpret data on system performance. Utilizes hierarchical lists. HTA is a means of describing a system in terms of goals and sub goals, with feedback loops in a nested hierarchy. Highly influenced by control theory. Extensions exist such as SHERPA (Embrey, 1986)</p>	<ul style="list-style-type: none"> Kirwan, & Ainsworth (1992) – Automation, Nuclear Power Corlett, Wilson, & Corlett, (1995) - Human Reliability Assessment Stanton (1996) – Nuclear Safety Bruseberg & Shepherd (2017) - Job Design 	<p>Highly flexible. Used for many purposes such as person specification, training, error prediction, team performance. Adaptability of human components. Effective for system design. Cost saving.</p>	<p>Lack of specificity. Typically, reductionist focus to predefined tasks. Difficulty in integrating broader system requirements and interactions. Minimal focus on psychosocial elements. Time consuming.</p>
<p><u>Rasmussen Risk Management Framework (RRMF)</u></p> <ul style="list-style-type: none"> Rasmussen (1997) 	<p>Safety Management, and focus on Accident Causation. Fundamental framework to systems HFE methodology. Modelling by functional abstraction. Inclusion of multiple system levels, from government to tasks. Distinct focus on actors.</p>	<ul style="list-style-type: none"> Svedung & Rasmussen (2002) – Accident Causation Johnson & de Almeida (2008) – Safety Science Cassano-Piche, Vicente, & Jamieson (2009) – Food Safety 	<p>Systemic, functional abstraction across numerous levels of the system. Acknowledgement of importance of the social component.</p>	<p>Highly directed towards accident causation. Minimal focus on Safety II. Minimal integration of interactions.</p>

<p><u>Cognitive Work Analysis (CWA)</u></p> <ul style="list-style-type: none"> • Rasmussen, Pejtersen, & Goodstein (1994) • Vicente (1999) • Naikar, Moylan, & Pearce (2006) 	<p>Facilitates human-centred design. Cognitive work analysis focuses on identifying the constraints that shape behaviour rather than trying to predict behaviour itself.</p>	<ul style="list-style-type: none"> • Higgins (1998) – Manufacturing • Miller (2004) - Healthcare • Ahlstrom (2005)– Air traffic Control • Birrell, Young, & Jenkins (2008) - Road transport • Salmon <i>et al.</i> (2016) - Rail level crossings • McLean <i>et al.</i> (2017) - Football • Carden, Goode, & Salmon (2017) – Outdoor education 	<p>Useful for both analysis and redesign. Highly generic. Flexible and low cost. Constraints that shape behaviour, useful for Safety II. Cost associated with CWA is insignificant relative to the cost of the systems engineering processes or standard techniques. Effective integration of numerous levels of the system.</p>	<p>Issue with designing of systems, due to reliance of current state of system and various components. Majority of literature associated with interface design.</p>
<p><u>Human Factors analysis and classification system (HFACS)</u></p> <ul style="list-style-type: none"> • Shappell & Wiegmann (2000) 	<p>Based on Reason’s 1990 Swiss cheese model. Utilizes four causal categories that identify active and latent failures. Developed to analyse human factors aspects within aviation.</p>	<ul style="list-style-type: none"> • Shappell & Wiegmann (2003)– Aviation Accidents • Lenné <i>et al.</i> (2012) – Mining Accidents • Chauvin <i>et al.</i> (2013) – Maritime Accidents 	<p>Taxonomical approach. Highly suitable for multiple accident analysis.</p>	<p>Highly focused on accident causation. Works backwards from event, through taxonomies. Issue with Safety II. More appropriate for safety management than generic modelling.</p>

<p><u>Functional Resonance Accident Model (FRAM)</u></p> <ul style="list-style-type: none"> Hollnagel & Goteman (2004) Hollnagel <i>et al.</i> (2008) 	<p>The FRAM model graphically describes systems as a network of interrelated sub-systems and functions which, although designed otherwise, will exhibit varying degrees of performance variation. Both an accident analysis and risk assessment tool</p>	<ul style="list-style-type: none"> Herrera & Woltjer (2009) – Aircraft Collisions Belmonte <i>et al.</i> (2011) - rail network control De Carvalho (2011) – Air traffic management 	<p>Focus centred on the interaction of system components and the associated effects. Structurally simple. Adopts a resilience engineering approach</p>	<p>Focus on accident analysis and risk assessment. Developmental modelling. Intense theoretical knowledge required. Large systems or complex systems under analysis often loses its holistic view. Time consuming.</p>
<p><u>Human Factors Investigation Tool (HFIT)</u></p> <ul style="list-style-type: none"> Gordon, Flin, & Mearns (2005) 	<p>Computer based tools, used in the investigation of incidents. Systems modelling through four categories including threat, situation awareness, error recovery and action error. This is highly directed to accident analysis.</p>	<ul style="list-style-type: none"> Gordon <i>et al.</i> (2005) – Oil and Gas accident analysis Kim, Na, & Ha (2011) – Maritime accidents 	<p>Comprehensive. Both paper and computerized versions. Question based, with logical progressive flow.</p>	<p>Highly accident focused. Difficulty in use for unfamiliar. Root cause focus. Comprehensive data is required to complete. Resources and time intensive. Efficacy is uncertain. Reduced flexibility for unexpected analysis characteristics.</p>

<p><u>Systems Theoretic Accident Modelling and Processes model (STAMP)</u></p> <ul style="list-style-type: none"> • Leveson (2004) 	<p>Constraints based modelling. STAMP model uses control theory and systems dynamics methods to describe the systemic control failures involved in accidents.</p>	<ul style="list-style-type: none"> • Ouyang, Hong, Yu, & Fei (2010) – Railway Accidents • Salmon, Cornelissen, & Trotter (2012) – Outdoor accident analysis • Kazaras, Kirytopoulos, & Rentizelas (2012) – Road tunnel safety • Song (2012) – Nuclear Power 	<p>Generic and flexible to domain of application. Concept of agents, technological components. Effective at providing a clear visual description of system hierarchy. Inclusion of mental flaws and importance of context.</p>	<p>High reliance on comprehensive data. Accident based analysis. In-depth knowledge and access are required, throughout the levels of the system. More effective at classifying technical control failures rather than complex human decision making.</p>
<p><u>Event Analysis of Systemic Teamwork (EAST)</u></p> <ul style="list-style-type: none"> • Walker <i>et al.</i> (2006) • Stanton (2013) 	<p>Based on HTA. Integration of goal-based structures. Incorporation of 3 networks: Task, Social and Information. Importance of the social component is highlighted, and their interactions.</p>	<ul style="list-style-type: none"> • Rafferty, Stanton, & Walker (2013) - Military fratricide • Griffin, <i>et al.</i> (2010) & Stanton <i>et al.</i> (2019)- Aviation • Salmon, Dallat, & Clacy (2017) – Elite Cycling • Neville <i>et al.</i> (2017) – Submarine Command 	<p>Significant focus on interactions and relationships. Highly comprehensive in analysis. Highlights the importance of communication and social components of work</p>	<p>Highly resource intensive, often requiring modelling tools and software. High reliance on comprehensive information and access.</p>

<p><u>Australian Transport and Safety Bureau (ATSB) Accident Investigation tool</u></p> <ul style="list-style-type: none"> • Underwood & Waterson (2013) 	<p>Modification of the Swiss Cheese Model. Sequential analysis of error. Recent inclusion of SAFETY II elements. Incorporates ACCIMAP components</p>	<ul style="list-style-type: none"> • (Hobbs, 2008)– Aviation • Baysari <i>et al.</i> (2008) & Underwood & Waterson (2013) – Railway incidents 	<p>Highlights the importance of context. Engages with system behaviour over time. Aims for a general framework.</p>	<p>Does not focus on overall system characteristics. Little information about structure and system boundaries. Validity of the tool is uncertain. Minimal focus on control and feedback. Tool to guide additional analysis, limited in its scope. Accident based analysis. Minimal instruction to practitioners. Lack of engagement with individual action.</p>
<p><u>ACCIMAP</u></p> <ul style="list-style-type: none"> • Rasmussen (1997) • Rasmussen & Svedung (2000) 	<p>Expansion of RRMF, Systemic accident analysis incorporating Safety II considerations. Normative work included.</p>	<ul style="list-style-type: none"> • Hopkins (2000) – Gas Plant Explosion • Vicente & Christoffersen (2006) – Public Health • Jenkins <i>et al.</i> (2010) – Public Shootings • Salmon <i>et al.</i> (2012) – Outdoor Accidents • Salmon <i>et al.</i> (2014) - Bushfires 	<p>Generic and highly flexible, introduction of safety II considerations, Nonlinear causal webs. Analyse dynamic behaviour</p>	<p>Highly directed towards accident causation. Time consuming. High reliance on resources for data collection. Absence of classification schemes. Minimal focus on control and feedback. Minimal engage with causes of decision making. Lack of taxonomies at each level. Reliant on subjective judgement of researcher.</p>

An initial model proposed was that of Reason (1990), known as the Swiss Cheese Model (SCM). Reason's model describes the interaction between system-wide "latent conditions" (e.g., inadequate designs and equipment, supervisory and maintenance failures, insufficient training and procedures) and unsafe acts made by human operators and their role in accidents. Weaknesses in these defences, created by underlying conditions and dangerous actions, allow defences to be breached and accidents to occur (Salmon *et al.*, 2012).

Both the Human Factors Analysis and Classification System (HFACS) (Shappell & Wiegmann, 2000), and the Australian Transport and Safety Bureau (ATSB) Accident Investigation tool (Underwood & Waterson, 2014), have modified this approach, utilized within aviation accident analysis (Shappell & Wiegmann, 2003; Hobbs, 2008). An additional tool, the Human Factors Investigation Tool (HFIT), discussed by (Gordon *et al.*, 2005), was developed attempting to engage with causation. This is a computer-based tool that models systems through four categories, including threat, situation awareness, error recovery, and action error. This has been used in oil and gas accident analysis (Gordon *et al.*, 2005) and maritime accidents (Kim *et al.*, 2011). These tools are highly directed to accident analysis and ensuring similar accidents are avoided in the future.

An essential component of modern systems analysis tools within HFE is that of Rasmussen's risk management framework (Rasmussen, 1997). The author describes the importance of modelling by functional abstraction to cope with the complexity of STS. As the STS consists of multiple system levels (e.g., government, regulators, company, company management, staff, and work) involved in production and safety management, safety must be considered emergent, a result of interaction between actors at these levels. This approach requires a detailed study of the means-ends relations of the work system. This framework has since been expanded upon significantly and is now known as ACCIMAP (Salmon *et al.*, 2017). This method differs from typical accident analysis approaches in that it is used to identify and represent the causal flow of events across the levels within STS.

Furthermore, there is acknowledgement and inclusion of “normal” work, an important criterion to establish resilience and Safety II (Hollnagel *et al.*, 2015). As the method is highly generic, ACCIMAP has been used extensively within safety management analysis (Waterson *et al.*, 2017a) as well as other domains such as public health (Vicente & Christoffersen, 2006). ACCIMAP does have its limitations, as it is highly time-consuming and resource-intensive with a high reliance on comprehensive data collection methods. It also remains highly accident focused (Waterson *et al.*, 2017a).

A further systems analysis tool is that of STAMP (Systems-Theoretic Accident Model and Processes), which is a constraints-based model that focuses on the interactions between system components and the control mechanisms used throughout the work system (Leveson, 2004). STAMP views accidents as resulting from the inadequate control of safety-related constraints (Leveson, 2004). Initially, an issue with STAMP was the lack of engagement with the mental modelling of human workers, and so subsequent analyses have also included “mental model flaws” to cater better for human control structures in the system since the method origins are in engineering (Leveson, 2004; Ouyang *et al.*, 2010).

STAMP provides taxonomies of error and failure modes that are used to classify the behaviours involved in accident scenarios. This results in little scope for analysts to include behaviours other than those deemed to have been failures of some sort (Salmon *et al.*, 2017). ACCIMAP, on the other hand, does not use a taxonomy of failure or error modes and so enables analysts to incorporate typical performance and to show its relationship with different behaviours. The need to monitor and understand performance that went right, as opposed to just performance that went wrong, has been strongly argued for by proponents of resilience engineering and Safety II (e.g. Hollnagel *et al.*, 2015; Braithwaite, Wears, & Hollnagel, 2015; Anderson & Watt, 2020).

An additional systems analysis tool is that of the Functional Resonance Accident Model (FRAM) presented by Hollnagel & Goteman (2004) and Hollnagel *et al.* (2008). The FRAM model graphically describes systems as

a network of interrelated sub-systems and functions to exhibit varying degrees of performance variation. FRAM has been used as both an accident analysis and a risk assessment tool in areas such as aircraft collisions (Herrera & Woltjer, 2009), rail network control (Belmonte *et al.*, 2011), and air traffic management (De Carvalho, 2011). This model, adopting a resilience engineering approach, is centred on the interaction of system components and the associated effects. Though highly comprehensive, the method relies on extensive knowledge and information regarding the system. The technique is, therefore, time-consuming and resource-intensive (Hollnagel *et al.*, 2008). Furthermore, it is noted that when analysing large or complex systems, the tool often loses its holistic view, and a more structured approach is needed (Herrera & Woltjer, 2009).

Shifting away from accident analysis, many ergonomics methods exist for examining performance generally, such as Hierarchical Task Analysis (HTA) (Stanton, 2006), EAST (Stanton, 2014), and CWA (Vicente, 1999). HTA is highly generalized, decomposing systems and behaviour into a hierarchy of goals, subordinate goals, operations, and plans (Stanton, 2006). EAST is based on HTA and analyses task, social, and situation awareness networks. EAST can be used to evaluate existing systems/evaluate the impact of new technologies/forecast system performance. There is, however, high reliance on reliable and comprehensive information. The tool requires detailed documentation and is also highly resource-intensive (Salmon & Read, 2019).

A versatile and flexible low-cost tool, as indicated by Read and colleagues (2018), is that of Cognitive Work Analysis (CWA), which provides a useful methodology to perform system analysis. CWA has been described as a mature analytical framework which can more extensively address system design issues than other methods from cognitive engineering (Lintern, 2008). It has strong roots in systems theory, according to (Sanderson, 2003). Read *et al.* (2015) notes the need for an essential distinction between analysis and design, although in practice, these activities are closely associated and mutually informing (Vicente, 1999). The use of the term “analysis” is intended to refer to the process of understanding the

constraints of a complex system using the tools of the CWA framework. The analysis outputs include representations such as the abstraction hierarchy (AH), the decision ladder, and the contextual activity template (Read, Salmon, Lenné, & Jenkins, 2015).

The framework leads the analyst to consider the environment within which the task takes place and the effects of constraints imposed on the system's ability to perform its purpose (Birrell, Young, Jenkins, & Stanton, 2012). According to Naikar, Lintern, & Sanderson (2002), the framework supports revolutionary rather than evolutionary design. This is crucial as analysis looks to investigate the possibilities for the system, often wholly reinventing rather than adjusting that which is already present. This is consistent with the change in thinking from Safety I to Safety II, acknowledging the importance of autonomy for the worker and the importance of the worker in engaging with the work system (Hollnagel *et al.*, 2015). This is reinforced by Vicente (1999), who recommends CWA for systems that need to support performance in the face of unanticipated variability and systems which have no precedent.

Summary and tool selection

Several HFE systems analysis tools exist. To cope with wicked problems, tools should provide a platform for the application of Wilson (2014) notions, and encourage both normative and formative modelling. Through this framework, optimized equifinality can be achieved to improve overall system resilience. A majority of tools within HFE are based on accident analysis, and few engage with normative analysis associated with Safety II. More general analysis tools do provide adequate scope for deconstructing systems through functional abstraction, although a significant issue is the majority of applications are within safety science, interface design, and industrial settings.

It is proposed that the selection of a systems analysis tool should consider the context within which it is to be applied. Firstly, as minimal research has been conducted in the Makana football context, the purpose of the current investigation is to establish more general system mapping to gain insight

into the sociotechnical system under analysis. Furthermore, the Makana context, as previously described, suffers from a lack of capacity and a lack of resources. It is, therefore, necessary to select a tool that is not dependent on participants having an engineering or systems theory background. Furthermore, for the tool to be useful, it must be low cost, not requiring computer-based programming, so that it can be performed in this context. Resource intensive tools, highly sophisticated tools, and accident-based tools are therefore not appropriate for this context.

As noted by Read, Salmon, Lenné, & Stanton (2016), CWA aims to identify design insights from the application of the framework and to use these insights within a participatory design paradigm. It promotes the collaborative involvement of multiple stakeholders to solve design problems based on insights gained through CWA. Considering the values of STS theory, the context of the application, the need for the participatory approach to ensure value to all stakeholders, CWA was selected as the systems tool for use in the present study.

Final Problem Statement

CWA has not been previously applied to understand administration of a sporting organisation. Furthermore, CWA has not been applied to a community-based sporting administrative context within a low middle-income country. In particular, in a country like South Africa with its complex history of injustice and inequality, which significantly impact the relationship between community and academe. Exploration of the usefulness of HFE complex systems tools in such contexts is therefore of scientific value. The final problem statement is, therefore:

To date, minimal literature has investigated LFAs in South Africa, particularly those who are not located near metropolitan hubs. A useful tool to engage with a complex socio-technical system with the characteristics of an LFA is cognitive work analysis. The purpose of the present study was, therefore, to investigate the functioning of the Makana LFA in South Africa, through the application of cognitive work analysis. More specifically, the study sought to highlight both the constraints and affordances through conceptual modelling.

CHAPTER 2

METHODOLOGY

Introduction

The review of literature has emphasized the importance of context with regards to the application of Systems HFE. This justification has important implications for the methodology of the current study. Consequently, this section is structured to justify methodological decisions and to ensure replicability. The methodology section will, therefore, be structured as follows: Study Design, Defining System Boundaries, Selection of General System Mapping Tool - Cognitive Work Analysis, Approach to CWA of the Makana LFA, Participant Characteristics, CWA Adjustments and Experimental Procedures. A review of the adjustments to the CWA method will be engaged in the integrated discussion.

Study Design

The current research adopted an exploratory qualitative case study design with elements of mixed methods. As described by Baxter & Jack (2008), the case study is useful for testing whether a specific theory and model applies to phenomena in the real world. Furthermore, it is valuable when not much is known about a particular issue. The study design, as seen in Figure 5 below, therefore depicts the approach to the initial research purpose: The application of HFE complex systems methodology in grassroots TID platforms in South Africa. The design includes the development of the research question as previously described, such as the embedded participatory approach, to needs identification, and the emergent characteristics of the research group.

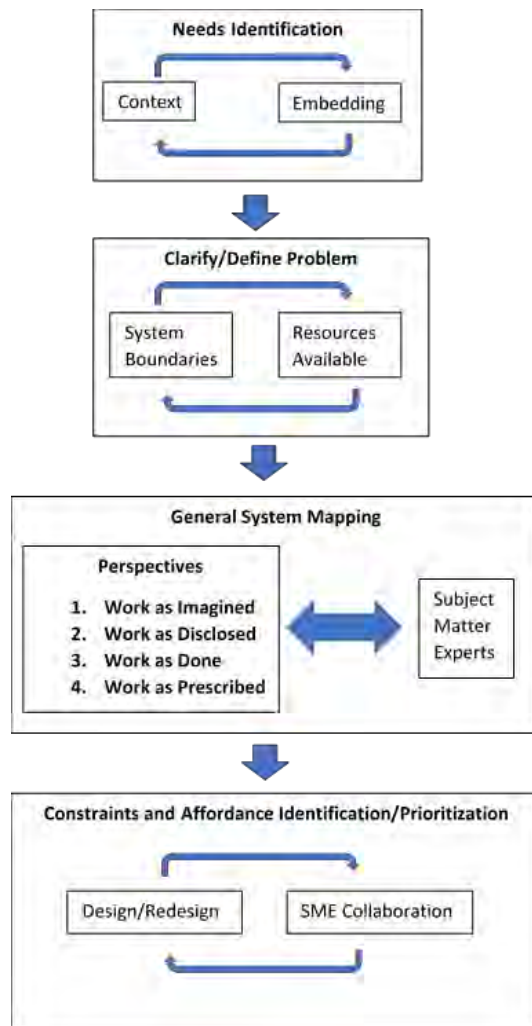


Figure 4: Study design of the current research study

The overall research process is described in Figure 4 above. 1) **Needs identification** – through contextual embedding, research needs are co-constructed. 2) **Define the problem and the scope of analysis** – sociotechnical systems are influenced by parent and sibling systems, and so it is vital to demarcate the scope of investigation based on the resources available. 3) **Identify the HFE complex systems tool for application** – This should consider the context of the study and stakeholder groups within the analysis. 4) **Mapping of Intervention Prioritization** - the fundamental aim of any research is to contribute to the improvement or efficiency of the sociotechnical system. The identification of constraints and affordances informs strategies to transition the sociotechnical to a more desirable state. The needs identification phase and the research question have been discussed and established within the contextualization section.

Defining System Boundaries

As shown in the review of literature, there is a dearth of investigations on the LFA structures in South Africa. Considering the number of players playing football at this level, investigating the characteristics of this system is a salient research objective. The context under investigation is, therefore, the foundation of the SAFA football TID infrastructure in South Africa, the Local Football Association. Furthermore, no studies have been conducted in the poorest province in the country, the Eastern Cape. This is an important consideration as an LFA in a metropolitan area will have different characteristics to one that is in remote Eastern Cape due to access to necessary community resources (Coovadia *et al.*, 2009; Leclerc-Madlala *et al.*, 2009). Therefore, the system of interest can be further reduced to an LFA in a remote under-resourced context.

As noted by Wilson (2014), the demarcation of system boundaries should be useful to the analysis aims. For the current investigation, the system boundary was placed at one LFA, serving as a case study. The reason for this is that the larger the sociotechnical system under review, a broader number of stakeholders must be engaged (Neumann & Village, 2012). Furthermore, HFE system theory methods have not been applied within the South African football TID context, so assessing its efficacy on a smaller scale is the logical initial step. The Makana LFA, within the Eastern Cape region of South Africa was therefore selected as the focal or target system (Thatcher & Yeow, 2016).

Moreover, contextual embedding and the building of credibility and trust (Burgess-Limerick, 2018) allowed for the identification of needs within this particular community. Administration and the volunteer nature of administrators were identified as a key area of concern amongst local stakeholders within Makana football. It is acknowledged that there are multiple stakeholder viewpoints to the functioning of the Makana LFA. However, due to the lack of systems-based tool application in the South African grassroots football context, and related project resources, the current investigation was limited to current Makana LFA administrators.

Selection of General System Mapping Tool - Cognitive Work Analysis (CWA)

CWA has been described as a mature analytical framework which can more extensively address system design issues than other methods from cognitive engineering (Lintern, 2008). Furthermore, it has strong roots in systems theory (Sanderson, 2003; Fidel & Pejtersen, 2004). It has also been applied within a variety of contexts, including; interface design (Vicente, 1999), road user evaluation (Cornelissen *et al.*, 2013), air traffic control (Ahlstrom, 2005) and healthcare (Miller, 2004), to name a few. To date, several studies have utilised CWA in sport (McLean *et al.*, 2017; Hulme *et al.*, 2019); however, none of these has been conducted in Africa, and none in a remote small urban context such as Makana.

For clarity, a distinction will be made between analysis and design (Read, Salmon, Lenné, & Jenkins, 2015), although in practice, these activities are closely associated and mutually informing (Vicente, 1999). The use of the term “analysis” is intended to refer to the process of understanding the constraints of a complex sociotechnical system using the tools of the CWA framework. The analysis process includes five phases, with outputs including visual representations such as the abstraction hierarchy (AH), the decision ladder and contextual activity template (Read, Salmon, Lenné, & Jenkins, 2015).

According to Naikar *et al.* (2002), CWA supports revolutionary rather than evolutionary analysis. Furthermore, this approach is consistent with Vicente (1999), who recommends CWA for systems that need to support performance in the face of unanticipated variability and systems which have no precedent. The tool is therefore suitable for the Makana LFA, with high variability (as noted by stakeholders), and minimal investigations into its structure.

The CWA framework leads the analyst to consider the effects of constraints imposed on the system’s ability to perform its purpose (Birrell *et al.*, 2012), and affordances that exist within the system (Elm *et al.*, 2003; Jenkins *et al.*, 2008; Kant, 2018a). By highlighting constraints in a systematic manner, the results of the five phases show how options for action become

progressively narrowed within a system (Vicente, 1999). Furthermore, more recently, the CWA framework has been shown to provide a platform for redesign through identifying opportunities within the system (Read, Salmon, Lenné, & Jenkins, 2015; Kant, 2018a). Therefore, the current study incorporated both constraint and affordance identification into its framework.

The aims associated with each phase are listed below (Table 5), including the conceptual model representation (Vicente, 1999; Jenkins *et al.*, 2008; Read, Salmon, Lenné, & Jenkins, 2015). As with all guidelines associated with CWA, these are to provide a framework for the researcher (Jenkins *et al.*, 2008).

Table 5: Cognitive Work Analysis Summary (Jenkins *et al.*, 2008)

<u>Phase</u>	<u>Role</u>	<u>Representation</u>
Work Domain Analysis (WDA)	Describe the system and its constraints, based on its purpose, its intentions, its functions, and its components.	Abstraction Hierarchy, Abstraction Decomposition Space (ADS)
Control Task Analysis (ConTA)	Model activities required to achieve functions, including the decision-making processes	Decision Ladder, Contextual Activity Template (CAT)
Strategies Analysis (StrA)	Describe how these activities are and can be achieved and how that constrains behaviour	Information Flow Map
Social Organization & Cooperation Analysis (SOCA)	Establish who does or could do the identified activities (Person or technology)? This step defines the allocation of tasks constraints.	All of the Above
Worker Competencies Analysis (WCA)	Cognitive Skills required for each activities or task and the associated constraints to performance	Skills Rules Knowledge (SKR)

Another way to view these phases is by considering the set of questions and concerns they address, as outlined by Bisantz & Burns (2008). These relate to the overall purpose of a system (Why?) and progressively narrow to the system-wide tasks to be performed (What?), the strategies within the organization to be invoked (How?), the roles and responsibilities for various “actors,” be they human or machine, to fulfil (By whom?), and finally, the competencies necessary for an individual working within the system to utilize (By what means?) (Jiancaro *et al.*, 2014).

CWA phases provide information that informs the following phases. For example, the functions identified within the WDA are also utilized within the ConTA. The relationship of each phase is demonstrated by Naikar *et al.* (2006). Jenkins *et al.* (2008) note that not all stages are necessary within an analysis, dependent on the nature of the sociotechnical system. However, they do argue that the WDA is the minimum that should be completed.

CWA typically uses subject matter experts to generate conceptual models (Vicente, 1999; Jenkins *et al.*, 2008). As a formative tool, the facilitator utilizes prompt questions to allow for the completion of each analysis phase. These prompt questions are effectively summarized by Read *et al.* (2016). The result is comprehensive conceptual models of the sociotechnical system, its constraints and its affordances. For more information regarding the theoretical background of CWA and its phases, please see appendix 1, as well as works such as Naikar *et al.* (2006), Jenkins *et al.* (2008), and Read, Salmon, Lenné, & Jenkins, (2015).

Approach to CWA of the Makana LFA

A vital consideration when analysing any socio-technical system is that it can be described from multiple perspectives. For instance, Faverge & Ombredane (1955) observed that how people think work is done is different from how work is actually done. Additionally, Hollnagel (2016) notes that work as done often differs from what it is imagined to be. This has implications for the policymakers who prescribe work, as they often know very little about the work environment (Miles & Randle, 2016). As workers

often choose what they say to regulators for fear of consequence to non-compliance (Wilkinson, 2016), there is a difference between policy and practice (Catchpole & Jeffcott, 2016). The same work or socio-technical system can, therefore, be viewed from several different perspectives. Furthermore, a lack of integration between perspectives often results in system dysfunction (Cassano-Piche *et al.*, 2009). Acknowledging these different perspectives was, therefore, deemed an important methodological consideration for the current research. SAFA policymakers may have a different perspective than those responsible for the implementation of the policy. Four broad categories or perspectives to work are indicated below (Shorrocks & Williams, 2016):

1. **Work-as-done (WAD)** is characterised by patterns of activity to achieve a particular purpose in a particular context.
2. The perspective of **Work-as-imagined (WAI)** is both the work that people imagine others do and the work that people imagine they might do.
3. **Work-as-prescribed (WAP)** is the formalisation or specification of work-as-done.
4. Finally, **Work-as-disclosed (WADi)**, which is what people say or write about work.

The national body SAFA is responsible for the functioning of the LFA at a grassroots community level. The majority of information about the organization structure and operation of the LFA is in document form provided by SAFA. The formalized prescriptive nature is, therefore, the Work as prescribed perspective. The current study consequently performed a document search to identify objectively documented instruction regarding the functioning of LFAs to generate a conceptual model of work as prescribed using CWA. Secondly, it was necessary to establish how the Makana LFA currently functions or is most likely to function (Jenkins *et al.*, 2008). As previously mentioned, subject matter experts are the most reliable source of information regarding the current functioning of a system. With this in mind, the expertise of administrators responsible for the running

of the Makana LFA is crucial to effective modelling of work-as-disclosed using CWA. This was to establish how the Makana LFA currently operates rather than engage with how it could potentially function according to multiple stakeholders.

Thirdly, there may be opportunities in the system that are not foreseen by SAFA, which may or may not be implemented at a local level. Participants often engage with how a system could potentially function, consistent with the work as imagined perspective. Phase three, therefore, was to complete the CWA with Makana LFA SMEs to generate the work as imagined perspective, conceptualizing the desired Makana LFA system state and context-specific recommendations to facilitate the transition of the STS. This conceptualization of the relationship between perspectives can be seen in Figure 5 below. Therefore, the study was designed as a comparison of work as prescribed, work as disclosed and work as imagined, of the Makana LFA, using Cognitive Work Analysis. This is a novel component of the current study as minimal literature has engaged with this framework within CWA.

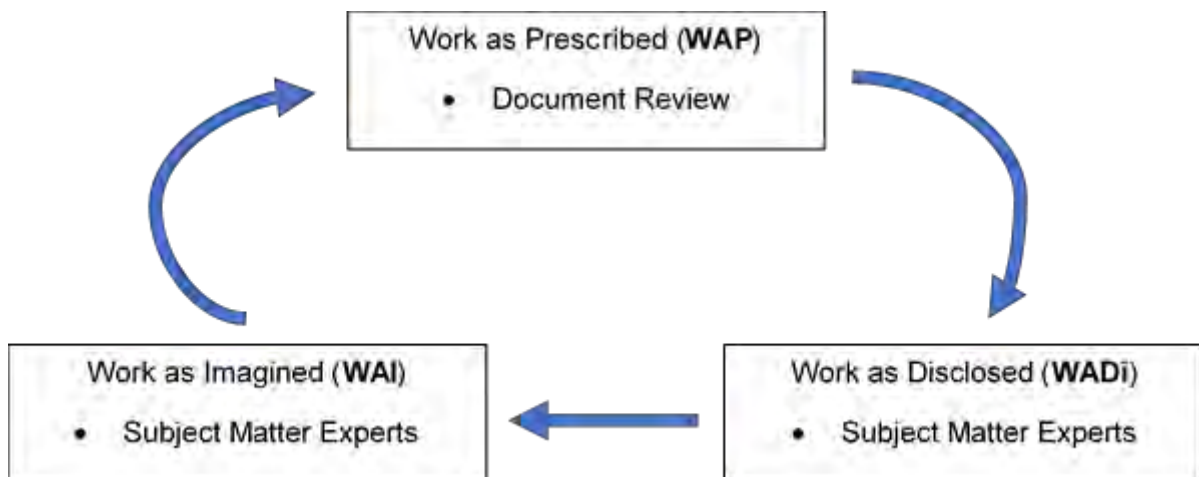


Figure 5: Diagram to demonstrate the perspectives potentially informing system redesign within the current analysis of the Makana LFA.

Participant Characteristics

Analyst

Authors such as Lützhöft *et al.* (2010) and Walker *et al.* (2010) highlight the importance of adopting an ethnographic approach to HFE research, while Kant (2018b) discusses the importance of the ethnographic technique within the CWA framework itself. Furthermore, HFE literature notes the importance of viewing activity intrinsically (Wisner, 1995). Consequently, and coupled with the historical mistrust, the current investigation has placed emphasis on such participatory approaches to build trust and embed within the Makana LFA community (Levin, 2012). For the current research project, the researcher, therefore, serves as both the facilitator and subject matter expert due to contextual embedding.

The embedded approach allows the researcher to engage with real problems in a real context (Hackett & Rhoten, 2011), while insider knowledge enables the researcher to tailor the research to meet the needs of the organisation (Rowley, 2014). It is acknowledged that conflicts do exist with this approach (Lützhöft *et al.*, 2010); however, this was necessary due to the context and challenges previously described.

Subject Matter Experts (SME)

As previously noted, the current analysis was limited to current Makana LFA administrators. To develop conceptual models of how the Makana LFA currently functions (Jenkins *et al.*, 2008), current administrators are best equipped to report on the internal workings of the Makana LFA. All current Makana LFA administration committee members (Five total subject matter experts) as of June 2019 were therefore afforded the opportunity to contribute.

The conceptual modelling method of CWA is used to generate useful models of the socio-technical system (Salmon & Read, 2019), allowing subject matter experts to develop knowledge of the barriers and opportunities available (Kant, 2018a), to shift the system from its current state (Read, Salmon, Lenné, & Jenkins, 2015). An important consideration was the

suitability of CWA to the Makana LFA context. How accessible are the terminology and framework within a context of second language English speakers with relatively low levels of formal education? It was necessary to engage with the background of the participants to frame any adjustments to the CWA method. A background questionnaire was, therefore completed by participants (appendix 4) to ascertain demographic characteristics such as education and LFA experience. Upon review, there was broad diversity in the backgrounds of subject matter experts (Table 6). Thus, it was imperative to make the process accessible to all, taking an inclusive, participatory approach and upholding the sociotechnical systems theory value of respect for individual differences (Read *et al.*, 2018).

Within CWA literature, it is noted that the facilitator plays a fundamental role, highly dependent on the theoretical knowledge of participants (Read, Salmon, Lenné, & Jenkins, 2015). Review of demographic characteristics of participants showed that three subject matter experts were not first language English speakers, and several participants educational level was that of high school completion. It was, therefore, necessary to simplify terminology that was not easy to follow. Consequently, adjustments were made, specified in the section below. Furthermore, as an embedded researcher, one has the expertise to facilitate the completion of conceptual modelling to the benefit of subject matter experts, thus assisting with the explanation and completion of the theoretical models.

Table 6: Demographic characteristics of Subject Matter Experts. The researcher is SME number 5.

SME	Age	Ethnicity and Home Language	Education	Occupation	LFA Experience	Administration Qualifications	Football Related Qualifications	Why did you volunteer to join the committee?
1	31	Xhosa, isiXhosa	Management + Local Governance Diploma (NQF Level 6)	Municipal Employee	3 years	Diploma in Management and administration	None	I wanted to contribute my skills to the association and give back to the community. I have development experience through my employment.
2	44	Xhosa, isiXhosa	Matric Certificate (NQF Level 4)	Butcher	9 years	None	None	I have passion for sport and being involved in community activities. I also want to share my knowledge with others.
3	31	Xhosa, isiXhosa	Matric Certificate (NQF Level 4)	Unemployed	9 years	None	Level 5 Referee Course	I wanted to change my community through sport. There are many negative things that affect the youth of Makana. Poor administration of local football is a significant challenge and I wanted to contribute.
4	25	White, English	MSc (Human Kinetics and Ergonomics (NQF 9)	Student	1 year	None	Postgraduate degree in football related fitness and coaching educational characteristics	There was an opportunity to not only further my research, but gain a deeper understanding of the constraints of stakeholders such as coaches.
5	30	White, English	MSc (Human Kinetics and Ergonomics (NQF 9)	Student	3 years	None	Postgraduate degree in football strength and conditioning	To contribute

Cognitive Work Analysis Adjustments

Work Domain Analysis (WDA)

Minimal adjustments were made to the WDA method as a whole, as the hierarchical abstraction (AH) is logical and relatively easy to follow. This expresses the benefits of the tool itself. Adjustments were, however, made to the complicated terminology. In the table below, the typical terms for the AH are noted, as indicated by Naikar *et al.* (2005), Stanton & Bessell (2014) and McLean *et al.* (2017). The related term for the context of this study is then specified, with the accompanying aim of the AH level.

Table 7: WDA abstraction hierarchy terms for Makana LFA analysis

Typical AH Terms for WDA	Term Used for Makana LFA Analysis	Aim of AH Level
Functional Purpose	Functional Purpose	Overall Purpose of the Makana LFA
Values and Priority Measures	Values	What is valued within the LFA STS?
Purpose related functions	Functions	How is work broadly distributed?
Object related processes	Activities	What are the activities that are performed within the LFA?
Physical Objects	Resources	What resources are required or used for relevant activities?

In our view, the tool must not hinder the conceptualization of the STS, and so it was important to reduce the complexity of the tool itself and instead focus on the complexity of the system. It was also vital for SMEs to agree on the design of the tool structure and accompanying description. With their agreement, there is greater empowerment and engagement in the process.

The WDA was therefore completed with the above-mentioned terms as the categories for the abstraction hierarchy. Means ends links (Naikar *et al.*, 2005) were also completed to describe the relationships between the levels of the AH.

Contextual Activity Template (CAT)

It was decided that the decision ladder, as developed by Jens Rasmussen, was not relevant within the context due to the vast range of decision-making required of subject matter experts. The researchers' experiences within the STS informed the decision based on the large variability of information received by administrators. To unpack these characteristics would over complicate the analysis, considering that this was the first use of the CWA tool in the Makana LFA context. The CAT itself is highly useful, as graphic models allow for a better understanding of the information associated with the system. A key decision for this conceptual model is the decomposition of activity into work situations according to space and time (Rasmussen *et al.*, 1994). For the purpose of Makana LFA analysis, SMEs agreed to depict time rather than location. This was justified by the high variability in location of activities for the LFA and the calendar year nature of the Makana LFA program. Therefore, for the CAT, the following was completed: 1) Decision on Time vs Location construct, 2) discussion of when activities typically occur, and 3) When activities could occur (but not typically) throughout the year program. This information was then graphically represented.

Strategies Analysis (StrA)

The Strategies analysis phase of the CWA posed significant difficulties with regards to its application. Although some practical work in improving the methodology of this phase, such as that by Cornelissen, Salmon, McClure, & Stanton (2013) and Hassall & Sanderson (2014), has been completed, there were challenges for application in the Makana LFA context. In our view, the terminology and structure associated with this step are complex and require a certain level of background in systems thinking. Furthermore, within the Makana LFA, there is a broad scope to activity and high variability

in task completion strategy. So the information flow chart (Read, Salmon, Lenné, & Jenkins, 2015) was deemed not appropriate. As a result, alterations were made to this phase to make it useful in this context. To make the phase accessible, simplified categories to engage with each activity were selected to guide SMEs discussion. These were loosely based on associated literature and oriented, as shown in the list below:

- **Purpose of Activity** (Why do we do this? Simplified WDA component)
- **Needs Analysis** (What do we need to perform this activity?)
- **Challenges/Constraints** (What makes it difficult when considering what needs to be done?)
- **Strategies to Complete** (What do we do to overcome? How could it be better (Work as imagined consideration)?)

Therefore, for the strategies analysis phase, the following was completed: Each activity of the Makana LFA was discussed in-depth, identifying the purpose, the needs of the activity, the typical challenges, and strategies that are employed to complete the activity.

Social Cooperation and Organization Analysis (SOCA)

As the SOCA phase was based on the CAT, minimal changes were made to this phase. The conceptual model is highly effective as the graphical representation makes it easy to denote the aims of this phase. The description of the stakeholders is highly beneficial in viewing the distribution of work across the system. A further useful characteristic was the identification of additional stakeholders needed to complete the task. This is an important consideration in stakeholders analysis literature (Co & Barro, 2009). Stakeholder considerations will be highlighted in the results section. The SOCA phase was therefore completed as follows: Relevant stakeholders or individuals were represented within the CAT graphic to denote who completes or is involved with each activity.

Worker Competency Analysis (WCA)

This step posed a significant challenge to the current investigation. South Africa has significant issues regarding historical oppression and inequality (Maylam, 2017). Furthermore, Rhodes University is a long way from being an African university due to an ivory tower approach (Roodt, 2005; Maylam, 2016), with related research historically done on the community rather than with the community (Ryan, 2020; in press). Assessing or prescribing intellectual or education-based requirement is therefore unwise within a low resources/low skilled context such as Makana, as it has an impact on trust and credibility within the community (Levin, 2012) and against the university new ethos of social justice and capacity building. In our view, it is easy to undermine volunteers. The skills knowledge rules (SKR) theoretical structure (Rasmussen, 1983) is, therefore, not appropriate for the volunteer organization of the Makana LFA.

Systems HFE literature also emphasizes that systems should be designed to fit the individual, not the other way around (Dul *et al.*, 2012). It was, therefore, not necessary for the initial conception of WADi. It was, however, redefined for the imagined perspective. For this perspective, WCA was completed as follows: SMEs discussed the desired characteristics of capable committee members. The purpose was to provide a guideline to community members when selecting members at the electoral congress.

Summary of the CWA Framework for application to the Makana LFA

The adjustments to the CWA framework are indicated in Table 8 below. These include the purpose of each phase, representation utilized for each phase (depending on the nature of the conceptual model), and the necessary prompt questions. Prompt questions were informed by Read *et al.* (2016), with alterations made to suit the context of the Makana LFA and the aforementioned tool adjustments.

Table 8: CWA framework for application to the Makana LFA

Phase	Purpose	Representation	Prompt Questions
Work Domain Analysis (WDA)	Describe the system and its constraints, based on its purpose, its intentions, its functions, and its components.	<p style="text-align: center;"><u>Abstraction Hierarchy (AH)</u></p> <ul style="list-style-type: none"> • Fundamental Purpose • Values • Functions • Activities • Resources 	<ul style="list-style-type: none"> • Why does the Makana LFA exist? What is the purpose? What are the goals, objectives, aims, intentions, or missions? • How can we tell if the Makana LFA is achieving its purpose? What is important to the LFA? What are the criteria, measures, benchmarks, tests, assessments, outcomes or results associated with the LFA? • What functions can be performed to achieve the purposes? How is work delegated or distributed in the Makana LFA? What are the roles, responsibilities, tasks, jobs or occupations? • What are the activities that relate to the functions in the Makana LFA? What do we use our resources for? What are the applications, characteristics, limitations and processes? • What resources are available to the Makana LFA? What do we use to complete the activities? What are the tools, equipment, technology, kit, gear, buildings, facilities, infrastructure, staff and people?
Control Task Analysis (ConTA)	Model activities across the Makana LFA calendar year	Contextual Activity Template (CAT)	<ul style="list-style-type: none"> • What are the work situations that exist in the Makana LFA? • Do they occur in different locations? Do they occur at different times? • When do they most often occur? Why is this the case? Why do they occur at these times and locations? • Is there any variability in their occurrence? What informs those differences?
Strategies Analysis (StrA)	Describe how these activities are and can be achieved	<p style="text-align: center;"><u>Discussion Framework</u></p> <ul style="list-style-type: none"> • Purpose of Activity 	<ul style="list-style-type: none"> • What is the purpose of this activity? • What do we need to get it done? • What are the challenges or constraints for the activity? What are the barriers?

		<ul style="list-style-type: none"> Needs Analysis Challenges associated with the Activity Strategies to Complete the Activity 	<ul style="list-style-type: none"> How do we adjust or adapt and overcome these challenges? How do we get the activity done? What are the different factors that may influence the range of possible strategies available to perform the identified tasks within the Makana LFA? Please describe strategies that are utilized. Are there different options? How do we select one strategy over another? What are the cues that prompt the selection or change in strategy? Does this relate to resources? What functions are necessary to realize these activities? What physical objects are required? How do workers manipulate these physical objects?
<p>Social Organization & Cooperation Analysis (SOCA)</p>	<p>Establish who does or could do the identified activities</p>	<p>SOCA - CAT</p>	<ul style="list-style-type: none"> Who are the main people in the Makana LFA? How could you categorize their roles? Are there teams? Do they have different responsibilities? Who does which task or job? Are there different people performing the same task at different times? How do we divide up the tasks? How does the team communicate and cooperate to perform identified tasks? How do the technical and social factors in the Makana LFA work together to complete related tasks?
<p>Worker Competencies Analysis (WCA)</p>	<p>Identify desired Characteristics of Makana LFA committee members</p>	<p>Mind map</p>	<ul style="list-style-type: none"> For the different tasks identified, what are the competencies or skills required? What knowledge is required of the Makana LFA? For the allocation of roles, what are the different skill sets required to perform each of these associated tasks? What skills does each position in the Makana LFA require?

Experimental Procedures

Ethical Clearance:

Prior to experimentation, ethical clearance was obtained from the Rhodes University Human ethics committee (Code: 2019-0563-683). The following procedures were then undertaken: 1) Gatekeeper permission was obtained from the Chairperson of the Makana LFA. 2) Participants were approached in writing (appendix 2) and briefed at an information session. 3) All questions and issues were raised and discussed extensively, and 4) informed consent forms were completed (See appendix 3).

Cognitive Work Analysis Procedures

The formative nature of this analysis method resulted in integrated discussions to identify the constraints and affordances for each phase, as previously outlined. Phases were completed chronologically, with some phases reconsidered, iterated or completed again. This was dependent on subject matter experts' perceptions.

Makana LFA - Work as Prescribed

The first stage was to perform a document review. For the current analysis, the focus was placed on the administrative responsibilities of the Makana LFA. While there are many other organizations, representatives, and stakeholders that are involved in grassroots football development, the LFA is the foundation of the national body SAFA's TID program. Administration, at this level, has the most significant potential to impact football participation and competition. Additional stakeholders were, therefore, identified in reference to the LFA.

SAFA does not explicitly specify documentation relating to the functioning of LFAs. Therefore, an important first step was to establish documents that are relevant to the organization of the LFA. It was decided that these documents should be in the public domain for ease of access for administrators. This was an important consideration, as according to Callow (2019), SAFA runs no training or capacity building opportunities in Makana.

Stakeholders such as coaches and administrators rely on information in the public domain. A literature search was, therefore, conducted with the following criteria:

Table 9: Inclusion and exclusion criteria for work as prescribed literature search

<u>Inclusion Criteria</u>	<u>Exclusion Criteria</u>
Written Documentation, available through the internet. This is the most reliable and objective form of information, along with the most popular type of information gathering.	Documentation, not endorsed by SAFA, with no evidence of efficacy. This may apply to reviews or documents from other football-related structures in South Africa.
Documentation prescribed by SAFA regarding the functioning of an LFA. Explicitly named or intimated.	Documentation related to functioning of National, Provincial or regional infrastructure with no direct mention of the LFA or its functioning.
LFA documentation with direct relevance to the structure and completion of the CWA. I.e., Any mention of functional purpose, values, activities, functions, objects related to the LFA. This applies to all steps.	No reference to LFA functioning, organizational design or related activities.
Any mention of the structure of work such as roles or delegation of responsibilities within the LFA	Documents outlined by other organizations (e.g., DSRAC) that indicate perceived responsibilities of the LFA
Rules and regulations relevant to the LFA	
Instructions for how LFA related jobs are to be performed, dissemination of tasks	
Documents indicated by SAFA as essential to LFA functioning	

The SAFA website contains the majority of relevant documentation (SAFA Website - <https://www.safa.net/>). The most appropriate tab is governance, which lists all the various aspects associated with SAFA. Its relationship to the Confederation of African Football (CAF) and FIFA, as well as the South African Sports Confederation and Olympic Committee (SASCOC). The laws of the game are aligned with the international body FIFA. Included here is the SAFA statutes tab, which is highly relevant. It lists SAFA national statutes, as well as individual statutes for the provincial, regional and local levels. The LFA document is fundamental to outlining the LFA purpose, roles, responsibilities, and structures. The first included document was, therefore, the SAFA LFA Statutes (2018).

The other statutes documents refer to different infrastructure levels and are not relevant to the operations of the LFA. One can also find the code of ethics and integrity documents on the governance tab. They are generalized and focus on the responsibilities of all stakeholders throughout the SAFA pyramid of operations. There was also an application of the statutes document. However, this is not relevant to the LFA as it is focused on activities at a national level.

Within the rules and regulations tab, the SAFA uniform rules document can be found. This is the standard document for football-specific operations, particularly match days and running of leagues. This is a necessary document for day-to-day operations for the LFA, with the LFA incorporated within the text for instructions relevant to its functioning. The second document was, therefore, the SAFA Uniform Rules (2017).

While there are additional documents for academies and other grassroots programs, these are not relevant to the Makana LFA as they are not within its jurisdiction. Annual reports can also be found on the website, submitted yearly. They indicate the progress of meeting aims such as vision 2022. Concerning LFAs, there is some mention, and so it was a document to consider. The latest report available was the SAFA Activity Report (2018), at the time of writing.

Additionally, there are football development documents. Other than the mission statement for development, all documents are taken from FIFA. While they are useful, they are not specific to LFAs. They do not mention them specifically, rather intimating general guidelines for encouraging grassroots participation. It was, therefore, not a direct document for the administration of the LFA.

A final source of information was through academic research channels. SAFA does not note this within their website or other dissemination means; however, it was crucial to identify any literature that may be relevant to the operational functioning of the Makana LFA. A literature search was therefore conducted utilizing the following keywords in an attempt to identify any documents that are relevant to the Makana LFA: South African Football Association, SAFA, Documents, Administrative documents, Paperwork, Local football association, LFA, Football, Soccer, Makana, Makhanda.

Searches were conducted on both google and google scholar. Combinations of the different keywords were utilized to isolate any relevant literature. The google search identified many media articles and publications, which were not definitive documents for the LFA. Minimal literature was relevant to the LFA, which is at the bottom of the SAFA structure pyramid. A significant portion of the articles found are linked to the national level, PSL, or provincial governance. The most important document that is worthy of inclusion is the technical masterplan document. This is the document noting the plan for Vision 2022, the aims of SAFA, and the accompanying structures and formats for all associated leagues and governance. It informs some of the fundamental components and strategies of SAFA concerning the LFA. The link for this document does not work on the SAFA website at the time of writing. The final document for inclusion was there for the SAFA Technical Masterplan (2012). Thus, the list of included documentation is noted in Table 10 below.

Table 10: Results from literature search for prescribed SAFA documentation

Included documentation for Work as Prescribed CWA
1. SAFA LFA Statutes
2. SAFA Uniform Rules
3. SAFA Technical Masterplan

LFA committee members with 8+ years of experience were asked if any additional documents worth noting were not within the list. The list was deemed complete. Once relevant literature was collected, documentation was analysed and served as a source for conceptual modelling within the CWA process. If information within the documentation limited completion of the CWA process, a decision was made accordingly. As emphasized by Jenkins *et al.* (2008), the WDA must be completed, which is the minimum aim of CWA application.

Work as Disclosed and Work as Imagined

Development of WAD and WAI perspectives involved current LFA committee members at the time of experimentation. The phases of the CWA were facilitated by the researcher over 12 three-hour workshops. Therefore, the process of performing the CWA on the Makana LFA took a total of 36 hours of group discussions around the various phases. All sessions were completed in the Eastern Cape Academy of Sport High-Performance centre, in the JOZA location. All sessions took place outside of working hours, typically on weekday evenings. All participants were collected for workshops and transported to their homes following the completion of each session. Relevant phases were completed identifying constraints and affordances within the Makana LFA sociotechnical system. A large marking board was used, and each conceptual model was developed. In most phases of work as disclosed, participants commented on work as imagined. This was recorded and referred to at a later stage. In addition, participants were required to complete a workshop review survey (Appendix 5) upon completion of experimentation to inform the review of the methodological

approach. The summary of sessions and phases completed can be seen in Table 11 below.

Table 11: CWA with Subject Matter Experts – Session Summary

<u>Session</u>	<u>Analysis Phase</u>
Introductory Session	Session Planning, CWA overview
1	Work as disclosed - WDA
2	Work as disclosed - WDA
3	Work as disclosed – CAT, Work as Imagined CAT
4	Work as disclosed – StrA
5	Work as disclosed – StrA
6	Work as disclosed – StrA
7	Work as disclosed – StrA
8	Work as disclosed – StrA
9	Work as disclosed – StrA
10	Work as disclosed – SOCA-CAT, Work as Imagined WCA
11	Work as imagined – WDA and Strategies Analysis
12	Work as imagined – Strategies Analysis and SOCA-CAT

The role of the analyst is to remain objective and to allow those with the knowledge of the system to be afforded the opportunity to voice their opinion. The embedded nature of the researcher ensures knowledge of mediation in this context and is familiar with the social dynamics of the stakeholders (Marshall, 2014). Furthermore, the researcher is a subject matter expert and so can contribute meaningfully to conceptual modelling (Hackett & Rhoten, 2011; Rutti *et al.*, 2016). At this point, it is important to note a conflict of interest that arises from the embedded research approach. By integrating into the system, the researcher inherently alters the state of the system itself (Burns, 2014). Considering the positioning of the researcher as a member of the LFA committee, true neutrality is not

realistic. An inherent bias will result from serving within the organisation under analysis. Furthermore, there are obvious motivations in that the researcher is driving towards the completion of their research project. Negotiating the status as a researcher from within is challenging. Additionally, it is acknowledged that this has a direct impact on the extrapolation potential of research findings (Village *et al.*, 2014) due to the unique involvement and status of the researcher within the system.

However, due to the complexities of the context (as previously described), this was deemed a necessary methodological decision. As valid and reliable information regarding the system was a priority, the embedded research program was required. Furthermore, to be consistent with the contentions of Wilson (2014) and other authors, embedding was deemed as a necessary and important step within the socio-political history within the South African context. This involved certain compromises on objectivity and the introduction of bias. The approach of the current research is to disclose and review the process in its entirety, attempting to acknowledge these aspects, contextualise the research and inform future research.

All steps, workshops, and interactions were recorded both audibly through the use of an audio recording device and documented through written work or photographic means. All data were stored on file and were encoded. All workshops were conducted in English. It was acknowledged that several participants were not first language speakers. In the case of misunderstanding, bilingual participants facilitated translation when necessary throughout the process. Following the completion of data collection, audio recordings were transcribed and analysed. Direct quotes were then attributed to findings by the researcher and are included in the integrated discussion.

Statistical Procedures

Due to the formative nature of the analysis, no statistical method was employed. The purpose of the analysis was to develop conceptual models, which are then utilized to inform effective intervention strategies. Graphical outputs are associated with the CWA process and were produced for the three desired perspectives.

CHAPTER 3

RESULTS

Introduction

The main objective of the current study was to gain insight into the functioning of the Makana LFA, based in Makhanda, Eastern Cape. CWA application in this study included three different perspectives on the characteristics of the STS; work as prescribed (WAP), work as disclosed (WADi), and work as imagined (WAI). Work as prescribed reports on the review of SAFA documents relating to information relevant to the LFA, and demonstrates how work is envisioned by governing body policymakers. WADi then reports on how SMEs of the Makana LFA describe the current functioning of the LFA. Finally, WAI demonstrates how these same SMEs propose the sociotechnical system could be redesigned. The purpose of developing conceptual models from three different perspectives (Work as prescribed, work as disclosed and work as imagined) is to identify mismatches and to inform potential redesign. As a result, each phase of CWA will be engaged separately in order to consolidate conceptual models for the three perspectives. Following these different perspectives, a composite comparison between perspectives is presented. This is designed to ensure a logical flow within the results.

Cognitive Work Analysis is a formative method involving multiple iterations to generate consolidated final conceptual models. WADi and WAI utilized workshops, which are highly informative for SMEs, allowing for engagement with their unique STS. In thesis format, it is not possible (indeed, it is not the purpose) to represent these dynamic interactive, integrated discussions with the conceptual models developed through CWA. Rather for the purposes of the current thesis, final conceptual models will be presented for ease of analysis. It is important to note that conceptual models are often highly complex and difficult to appreciate for those not involved in the process. They are, however, beneficial to SMEs who are involved in their development (a key purpose of CWA). Key findings will, therefore, be highlighted for each phase of the CWA application. For additional

information regarding workshop discussions, the link to all audio recordings can be viewed in appendix 10. Due to the full-page presentation of conceptual models, there are occasional blank spaces within results.

Work Domain Analysis (WDA)

Work as Prescribed

An initial purpose of the work as prescribed perspective was to identify relevant documentation for the analysis of the Makana LFA according to the governing body SAFA. These were used to complete the conceptual models of the adjusted CWA (adjustments are noted in the methodology on pg. 75). The application of CWA with the use of available documentation from SAFA posed significant challenges to the completion of all analysis phases. More specifically, only phase one was completed, whereas phases two through five were not completed due to insufficient detail available to inform the development of conceptual models (See Table 12 below). As a result, the WDA was the only phase completed and is discussed in the following section. Additionally, for the WAP perspective, means-ends link implications are noted within the discussion chapter. A full description of this WAP phase can be found in appendix 6.

Table 12: Summary of CWA for Work as prescribed

<u>Phase</u>	<u>Review</u>
WDA	Completed
ConTA - CAT	Time and location of activities is resolved by administrators within the system, and so a generic CAT could not be developed due to a lack of context specificity.
StrA	Strategies Analysis requires context dependant information, and so strategic approaches are not explicit within the documentation.
SOCA-CAT	For the purposes of the current analysis, SOCA is built on previous steps. Although the distribution of work through committees is explicit, this is already represented in the WDA.
WCA	There is an indication of some aspects, such as legal expertise within the WCA phase. However, a comprehensive analysis was not possible for this phase.

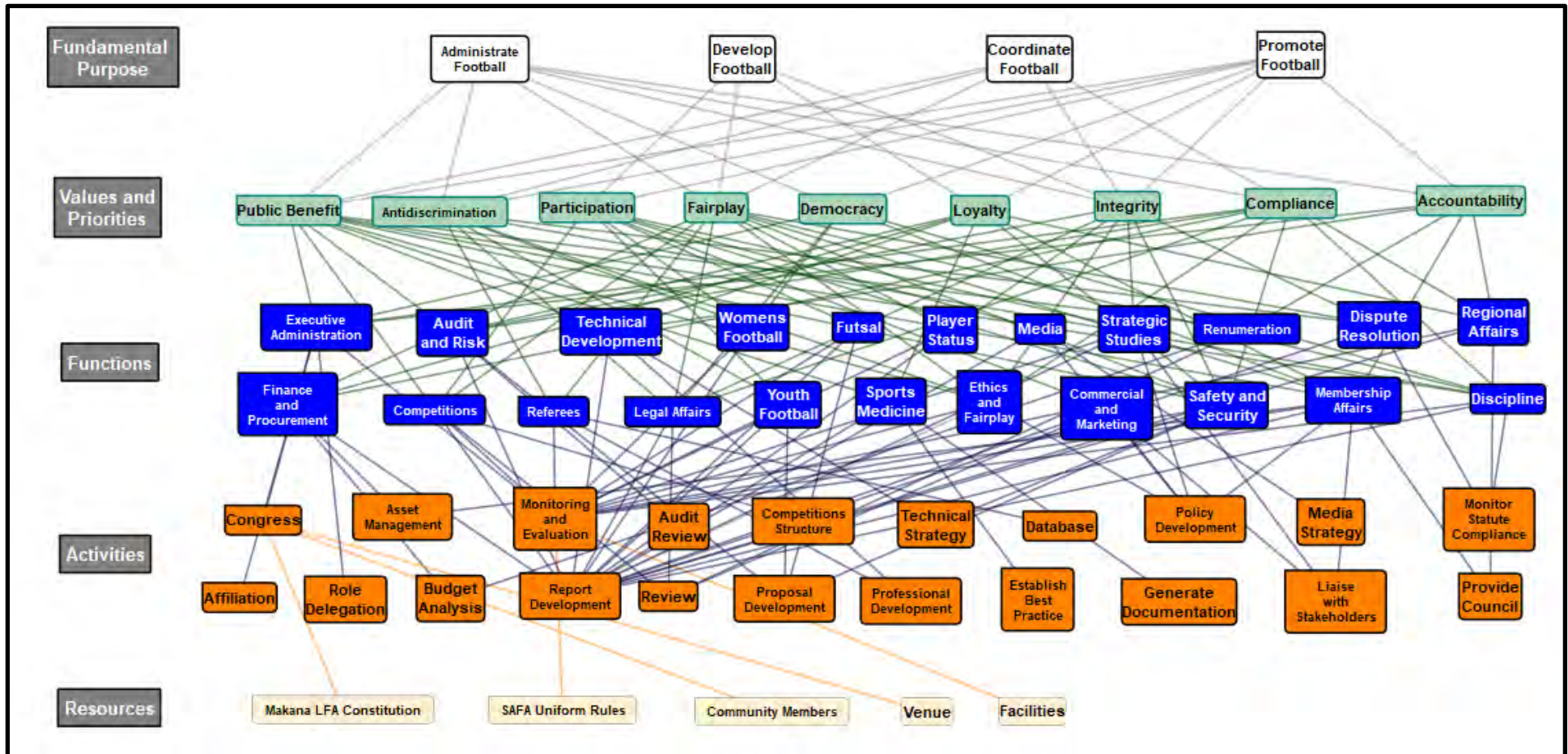


Figure 6: Work domain analysis for work as prescribed of the Makana LFA

The Abstraction Hierarchy of the WDA is used to provide a context-independent description of the STS (Rasmussen, 1985; Vicente, 1999). Figure 6 indicates that the abstraction hierarchy has clear fundamental purposes and these nodes have many connections with the lower levels of the abstraction. Concerning the functional purpose of the Makana LFA, four essential characteristics were identified; Growth of football, development of the game, administration, and coordination. At the second level of abstraction, it was possible to identify nine values and priorities underneath the functional purposes. These values, potentially categorized as transparency and integrity, indicate the broader priorities of SAFA. These included democracy, fair play, anti-discrimination and accountability. Regarding the growth of the game, aspects such as participation and public benefit are also highlighted. Furthermore, the documentation describes the LFA as a subordinate to the broader SAFA infrastructure, and so compliance to associated SAFA documentation is important.

The functions level of the WDA proposes how work should be divided across the LFA system and is partitioned according to 22 functions; thus, each value was linked to several functions that need to be fulfilled to achieve the purpose according to SAFA documentation. Each of these was associated with the committee structure of the local football association. Executive administration, for instance, oversees the additional functions related to standing committees. Functions that aim to coordinate football include competitions, futsal, referees, and women's football. Administration of football includes functions such as audit and risk, legal affairs, player status, ethics and fair play, and discipline.

SAFA defines four functions for ensuring the development of football; technical development, youth football, sports medicine and strategic studies, whilst the promotion of football includes media and commercial and marketing functions. SAFA has documented a vast number of corresponding activities that must be performed to meet the requirements for each function. It should be noted that the reviewed SAFA documentation is generic rather than prescriptive in the nature of the activities. This means that there is minimal specificity in instruction. It rather proposes needs that

must be fulfilled to achieve the goals of football growth and development. Examples of these activities or processes include role delegation, monitoring and evaluation, proposal development, professional development, technical strategy and policy development. It is useful to note the number of connections for each node, representing the relative demands placed on each component. Means-ends-links (connections between AH levels) notes that monitoring and evaluation has 12 connections, while report development has 18. These are, therefore, crucial nodes within the WDA. Means-ends-links, therefore, represent the importance of oversight and effective communication and the complexity associated with gaining appropriate oversight and management of these nodes.

The resources level of the WDA for WAP is poorly populated. SAFA prescribed documentation demonstrates very few resources, not due to the requirements of the system, but rather the lack of specifications within the documentation. The impact of this will be highlighted in the discussion section of the thesis. SAFA does define some resources important to the functioning of the LFA, but few physical artefacts. This includes documentation such as uniform rules, as well as the necessity of aspects such as facilities and venues.

Work as Disclosed

Work as disclosed engages with the perspectives of the subject matter experts. As a result, the conceptual model components identified by the subject matter experts are included as well as a brief explanation for the rationale behind their thinking/argumentation. This is deemed a crucial approach to the results structure, as it provides insight into how SMEs report on current system functioning. Presentation through AH labels is for guidance purposes. A full description of work as disclosed can be found in appendix 7.

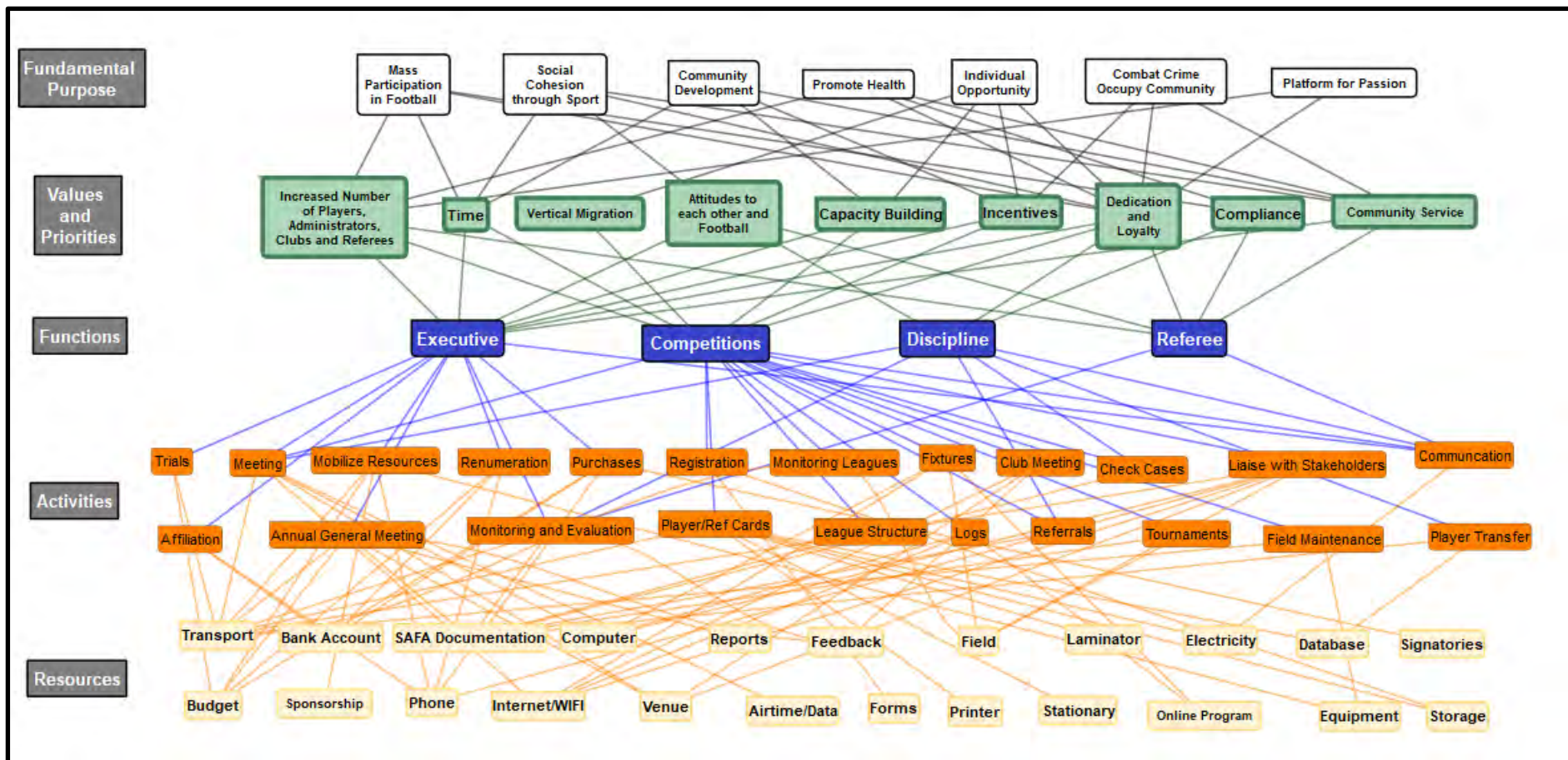


Figure 7: Work Domain Analysis for work as disclosed of the Makana LFA

Fundamental Purpose

The subject matter experts for the Makana LFA identified seven fundamental purposes of this socio-technical system (Figure 7). The first is mass participation in football, with SMEs noting a focus on ensuring community members are afforded the opportunity to compete in Makana LFA competitions. Furthermore, SMEs proposed the purpose of health promotion, as in their view, sporting participation and physical activity are important for community members. In addition, improved social cohesion within the community through structured interactions was deemed an important purpose. SMEs noted that there is often a tendency for inactive youth to be tempted into drug and crime culture prevalent in South Africa. Therefore, SMEs argued for the inclusion of combating crime within the local community as an important purpose to keep the youth active and occupied. Similarly, a purpose of the LFA is to provide motivation for community members through individual opportunity, community development as a whole, and a platform for passion, due to the popularity of football within the local community.

Values and Priorities

Participants identified large participation numbers (in the various aspects of football (i.e., not just player numbers, but clubs, administrators, etc.)) as critical to achieving the fundamental purposes of the LFA. Higher numbers allow for the promotion of active, healthy living and increased levels of competition. Furthermore, increased participation creates a broader reach to combat crime. Value is also placed on opportunities and rewards, valuing time contributions, vertical migration, capacity building and incentives for all active participants in local football. SMEs also emphasized that motivating community members to act as role models is vital to the Makana LFA. Thus, SMEs value respectful attitudes and self-sacrifice through service to the community within Makana football. SMEs contended that within a resource-scarce community, there is a greater focus on dedication within this organization as opposed to high-level academic qualifications. Dedication and loyalty to local football are therefore identified as a value within the Makana LFA. Finally, compliance with both higher structures and

documentation is noted by SMEs as important due to the role of the Makana LFA within the SAFA infrastructural hierarchy. The implications of these observations are teased out in more detail in the discussion section of the thesis.

Functions, Activities and Resources

According to SMEs, each of the functions identified was associated with related activities and corresponding resources. Consequently, for the current results section, each function will be discussed and the resulting connections unpacked. In addition, the number of connections associated with each function will be indicated in brackets to represent means-ends links. Although this does not represent the related demands of each activity, it does provide insight into the associated workload.

Only four functions were identified by the SMEs of the Makana LFA. The distribution of work was viewed through committee responsibilities with functions demarcated accordingly. This does potentially conflict with the WDA being stakeholder independent. However, the SOCA phase engages with individual members of the committee structure, while WDA structures relate to broader responsibilities. This was, therefore, an SME decision based on the nature of the context and the actual structures in place that represent the functioning of the Makana LFA. According to the SMEs, when considering how the LFA currently functions, it was possible to identify four functions; Executive Administration, Competitions Organization, Referee Logistics and Dispute Resolution.

According to SMEs, Executive administration (8 corresponding activities) relates to the prevailing committee within the LFA. This function has a vital role in monitoring and evaluating all aspects of local football. Thus, reports and feedback, as well as SAFA documentation, are deemed important by SMEs to ensure adequate and transparent functioning. This function includes the organization of the Annual General Meeting (AGM) which allows for stakeholders to discuss relevant points regarding the current and future functioning of the LFA. Executive administration is further responsible for the financial aspects of the LFA, including the mobilization

of resources through engagement with relevant stakeholders. Executive administration is also responsible for the organisation of remuneration to referees as well as purchases for resources such as fields marking materials.

Moreover, the affiliation payments and appropriate reporting are associated with the executive node. As a result, the LFA requires a bank account, an agreed-upon budget as well as sponsorship to improve the financial status of the LFA. The executive further needs meetings which in turn necessitates a venue, as well as transport. Finally, the relevant trials and talent identification components serve to encourage and facilitate vertical migration. All activities require effective communication, requiring internet and WIFI connections.

The competitions organization function has the most corresponding activities (**13**) to perform. The means-ends link approach indicates this node as fundamental to system functioning. Furthermore, SMEs noted competitions as having the highest workload and as the most important committee within the LFA. SMEs indicated that some activities that are required within the LFA are often taken over by the competition function due to a lack of active committee members. This function is responsible for the league structures, establishing the number of affiliates, the teams at each playing level, and the promotion and relegation of teams at the end of the season etc.

According to SMEs, the competitions function is also responsible for the registration of players for each division. Registration requires transport to collect forms from various drop off points, SAFA documentation regarding required forms, as well as monitoring and evaluating the completion of documentation. Associated with the registration of players is the production of player cards to ensure identification of players by the referees at the field. This ensures only approved players are allowed to compete. The effective management of these activities requires a large amount of administrative equipment, including; computers, phones, internet (WIFI), laminator, printer and stationery. Competitions organization also has several responsibilities such as club meetings where clubs are informed of

structures and related plans. Organization of tournaments throughout the year is also an important activity, according to SMEs. Another duty of competitions organization is the monitoring and evaluation of equipment and field maintenance. This requires storage space for resources such as referee equipment. Finally, the competitions committee are involved with referrals and monitoring misconduct, establishing relevant documentation prior to referral to discipline.

The discipline (5) function ensures compliance with SAFA documentation and relevant regulations and ensures a measure of fairness and transparency within the LFA. SMEs report that monitoring and evaluation of conduct both on and off the field is an important activity of the discipline function. Furthermore, dispute resolution is a primary objective through the WDA activity component of checking cases. The discipline function receives referrals from competitions and establishes disciplinary procedures, including meetings to develop reports and definitive action for each case. The final function is that of referee's logistics (2), with the responsibility for monitoring and evaluation of activities on the field of play.

Work as Imagined

Following the construction of CWA for work as disclosed, an important step was engaging with work as imagined. How could the Makana LFA be redesigned according to SMEs? Utilizing the WDA from the work as disclosed perspective, SMEs then reviewed how nodes and connections could be added or adjusted. These adjustments to the work as disclosed are noted in black in Figure 8 below. The functional purpose was consistent with the work as disclosed perspective, and the only addition to the values was that of Ubuntu (Benevolence/generosity). This is an important aspect for work as imagined within the Makana context as it has implications for recommendations to SAFA. See discussion for further details on this concept and the implications.

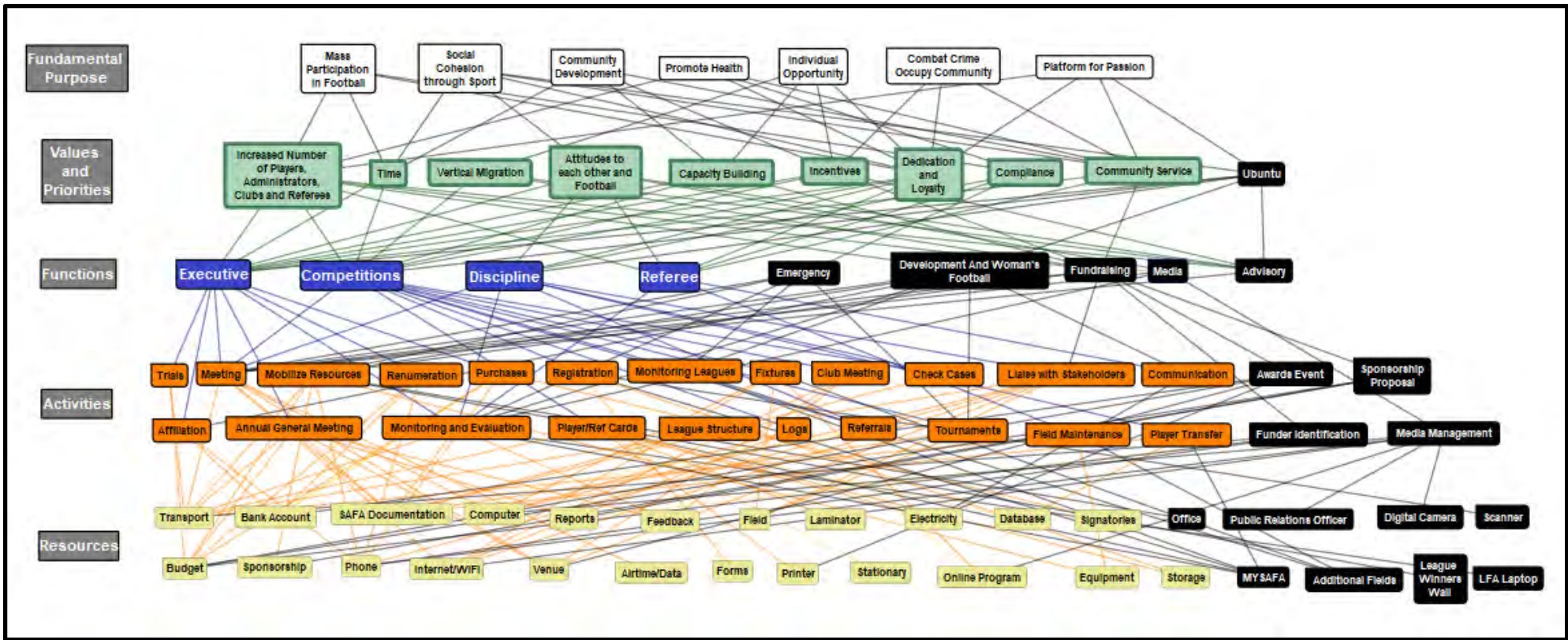


Figure 8: Work Domain Analysis for work as imagined for the Makana LFA. Black components denote additions to the work as disclosed WDA.

At the function level of the hierarchical abstraction, as previously indicated, the distribution of work within the LFA is done according to committee. Both the WDA for WADi, and standing committees prescribed by SAFA, were reviewed and discussed to establish which were relevant to the Makana LFA. The following were deemed necessary to the functioning of the LFA (dependent on human resources), and are listed by importance (Table 13). The number of associated activities is indicated in brackets.

Table 13: Subject matter experts proposed committee structure of the LFA. Committees indicated in **bold** are additions to the work as disclosed WDA.

<u>Committee</u>		<u>Roles and Responsibilities</u>
1	Executive Committee (7)	Oversight over standing committees. Long term planning and direction of the LFA. Engagement with stakeholders, management of facilities.
2	Competitions Committee (11)	Competitions organization, player registration, league organization.
3	Discipline Committee (6)	Dispute resolution, enforcement of the constitution. Ensuring the values of the LFA are upheld
4	Referees Committee (3)	On-field conduct, reporting on facilities
5	<u>Emergency Committee (5)</u>	For emergency decisions, such as payments or fixture issues. Dealing with emergent issues
6	<u>Development and Women's Football Committee (7)</u>	Essential to monitor youth leagues and grow women's football
7	<u>Fundraising Committee (6)</u>	An overarching constraint is lack of funds, and a more concerted effort is needed to develop the LFA
8	<u>Media Committee (3)</u>	As social media etc. grows it is vital to have a consistent image and transparent communication
9	<u>Advisory Board (1)</u>	To engage and harness the experience of local community members

SMEs noted the addition of five committees: Emergency, development and women’s football, fundraising, media and advisory. With regards to means-ends-links, pre-existing activity nodes such as communication and meeting are included for all new additions. At the same time, monitoring and evaluation is necessary for the emergency and development committees, respectively. Furthermore, as a result of these new functions, some activities were added to the LFA work domain analysis for work as imagined. Consequently, there are resource requirements that were provided by subject matter experts. These can be viewed in Table 14 below. Two additional resources are associated with all committees, including an official LFA office and an LFA laptop or computer.

Table 14: Activities and resources additions to the work domain analysis of the Makana LFA

<u>Committee</u>	<u>Additional Activities</u>	<u>Additional Resources</u>
Fundraising	<ul style="list-style-type: none"> • Awards Dinner • Identification of potential funders • Sponsorship proposals • Funders meetings and MOU development 	<ul style="list-style-type: none"> • Public relations officer • Digital Camera
Media Committee	<ul style="list-style-type: none"> • Manage Social media accounts. Engage with media stakeholders such as Grocotts. • Complete club profiles, history of each club etc 	<ul style="list-style-type: none"> • Digital Camera • Social Media Accounts
Competitions		<ul style="list-style-type: none"> • Scanner • Additional Fields • League winners wall • MYSFAFA (Online league management system)

A fundamental addition is that of the online player registration and league management system, MYSFAFA. This system was released during the 2019 league season and so was not in use at the time of experimentation but will

be in future. This system was designed to reduce the workload for the competitions committee, improve communication and transparency, and assist in the resolution of disputes such as player transfers. The introduction of MYSAFA does not mean that nodes relating to registration and cards are not needed. Rather the amount of time or energy invested in these activities is reduced, as the workload associated with some leagues is less. Importantly, SAFA may not have considered the challenges for work as done at the LFA level (an interesting area of research for future studies).

Control Task Analysis (ConTA) – Contextual Activity Template (CAT)

As specified previously, due to the nature of the documentation available from SAFA, it is not possible to develop a CAT for the work as prescribed; therefore, this section begins with the work as disclosed perspective.

Work as Disclosed

The CAT for WADi indicates the overall structure of the LFA calendar year, according to SMEs. This structure can be seen in Table 15 below. The typical season is informed by the South African Football Association and adopted by the Makana LFA, usually running from July to June, repeating each year. The CAT indicates the more intense periods associated with each activity through the use of the box and whisker symbols, while the shaded area indicates where activities may occur. Three significant overall findings were denoted by SMEs for this perspective:

- 1) **Volunteer Workload** – Administration of the LFA requires a significant number of activities throughout the calendar year.
- 2) **Delayed Season Start** - Administrative delays have a significant impact on the season structure.
- 3) **Competitions Committee Workload** – The Competitions Committee has a large number of time-consuming tasks to complete within the Makana LFA. SMEs commented that the volunteer nature of the organization requires dedication and commitment from members throughout the year. This imposes considerable demands on these individuals. Workload related

findings will be highlighted in more detail in the strategies analysis phase to avoid repetition.

Furthermore, SMEs designated within the CAT that there are often significant delays in the commencement of the playing season. Thus, a number of important activities are performed in the January to March period, which should rather take place earlier in the season. This results in delays for the activities that constitute the initial phase of the LFA season, such as annual general meeting (AGM), affiliation, club meetings, registration and players cards, as well as the league structures for the season. According to SMEs, this is typically due to administration issues such as committee member turnover.

Furthermore, the workload of the competitions function far outweighs the demands of others, and so this is an important distinction. A significant number of activities are required to be performed during the initial phases of the season (Table 15). These establish league related activities that run for the duration of the year, such as monitoring and evaluation, fixture and logs, field maintenance, referrals and evaluation of disciplinary cases. In addition, a number of yearlong administrative activities such as meetings, mobilization of resources, liaising with stakeholders and communication were noted by SMEs. See appendix 8 for more details regarding the CAT for work as disclosed.

Table 15: CAT for work as disclosed for the Makana LFA. *Grey shaded area represents when an activity could take place, while box and whisker symbols demonstrate when it most often occurs.

Activity/Time	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
Meeting						○						
Affiliation						○						
Mobilize Resource						○						
AGM						○						
Trials		○										
Monitoring and Evaluation						○						
Club Meeting							○					
Registration							○					
Player Cards							○					
League Structure								○				
Fixtures										○		
Log										○		
Tournaments	○	○	○							○	○	
Referrals										○		
Check Cases										○		
Player Transfer							○					
Field Maintenance							○					
Liaise with Stakeholders						○						
Monitor Leagues										○		
Communication						○						
Remuneration											○	
Purchases							○					

Work as Imagined

In Table 16 on page 106, the desired calendar year for the LFA as provided by SMEs is represented. The general season is prescribed by SAFA, with transfer and registration windows included. However, as specified by the CAT for work as disclosed, timelines are not typically adhered to due to a variety of administrative issues. Subject matter experts concluded that the majority of activities should be completed early in the football year (July - September), providing a platform for the rest of the season.

High workload activities including affiliation, registration, league structure, fixtures, player cards should take place at the beginning of the year to reduce issues of misconduct and misinformation. The majority of the administrative load would then be confined to the initial three months of the season. To ensure effective functioning, constant monitoring and communication are highlighted, with committees adhering to communication guidelines.

As noted in the WDA for work as imagined, a number of new activities are recommended. Additional activities of the awards event, funder identification, sponsorship proposal and Media management have therefore been added to the CAT. These are shown in blue in Table 16. The award event should take place after the season is concluded, whereas funder identification and media management should take place throughout the year. Sponsorship proposal should again be informed by the budget and be completed early in the season. The distribution of work will be engaged in the SOCA-CAT phase section.

Table 16: Contextual activity template for work as imagined of the Makana LFA. Blue activities denote additional activities to the WDA.

Activity/Time	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
Meeting	[Activity bar with circle in SEPT]											
Affiliation	[Activity bar with circle in SEPT]											
Mobilize Resource	[Activity bar with circle in FEB]											
AGM	[Activity bar with circle in SEPT]											
Trials	[Activity bar with circle in SEPT]											
Monitoring and Evaluation	[Activity bar with circle in FEB]											
Club Meeting	[Activity bar with circle in SEPT]											
Registration	[Activity bar with circle in SEPT]											
Player Cards	[Activity bar with circle in SEPT]											
League Structure	[Activity bar with circle in SEPT]											
Fixtures	[Activity bar with circle in OCT]											
Log	[Activity bar with circle in FEB]											
Tournaments	[Activity bar with circles in SEPT, OCT, and JUN]											
Referrals	[Activity bar with circle in FEB]											
Check Cases	[Activity bar with circle in FEB]											
Player Transfer	[Activity bar with circles in SEPT and FEB]											
Field Maintenance	[Activity bar with circle in SEPT]											
Liaise with Stakeholders	[Activity bar with circle in SEPT]											
Monitor Leagues	[Activity bar with circle in FEB]											
Communication	[Activity bar with circle in FEB]											
Remuneration	[Activity bar with circle in JUN]											
Purchases	[Activity bar with circle in SEPT]											
Awards Event	[Activity bar with circle in JUN]											
Funder Identification	[Activity bar with circle in SEPT]											
Sponsorship Proposal	[Activity bar with circle in SEPT]											
Media Management	[Activity bar with circle in FEB]											

Social Cooperation and Organization Analysis (SOCA-CAT)

Work as Disclosed

Phase four of the Work as disclosed perspective involved a SOCA - CAT. The purpose is representing the distribution of work across the active committee members within the Makana LFA. This is based on the CAT developed within phase two of the CWA process. The relating workload of those within the organization can then be unpacked. An important finding of the current study was the lack of active committee members involved with the administration of the Makana LFA. Thus, there is a high demand for those who are active and involved.

Overall, there are ten elected executive committee members. Of those, five are inactive, and one resigned during the course of the year in which this study was conducted. The SMEs suggested that a vital impact of inactive members is the lack of formation of standing committees. This is a noteworthy emergent issue that limits the functionality of the system. Thus, active members are noted in Table 17 and Table 18 below. These active members of the Makana LFA served as subject matter experts for this investigation.

An interesting reflection from discussions amongst SMEs was the requirement of additional stakeholders to complete activities. For instance, a club meeting requires the clubs to be present, while liaising with stakeholders requires participation from those stakeholders. The current analysis therefore categorized agents according to two groups, active committee members who perform administrative activities, and the additional stakeholders necessary to complete activities that require the participation of more than just administrative committee members.

Table 17: Active committee members and related stakeholders for the Makana LFA. Colours serve as a legend for the SOCA-CAT in Table 18.

<u>Committee members</u>	<u>Colour</u>	<u>Stakeholders</u>
Treasurer	Green	Clubs – Affiliation, AGM, Trials, Club Meeting, Registration, Tournaments
General Secretary	Blue	DSRAC – Mobilize Resources, Liaise with stakeholders
Competitions Member	Yellow	Municipality – Field Maintenance, League Structure, Mobilize Resources, Liaise with stakeholders
Local Member	Purple	Referees' – Monitoring and Evaluation, Tournament, Fixtures
Deputy Chairperson	Red	Rhodes (HKE) – Meeting, Mobilize Resources, Liaise with stakeholders

Table 18: SOCA-CAT for work as disclosed of the Makana LFA. Colours denote active committee members. The legend can be seen in Table 17 above.

Activity/Time	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	
Meeting	[Active members: Green, Blue, Yellow, Red, Purple]												
Affiliation	[Active members: Green, Blue, Yellow, Red, Purple]												
Mobilize Resource	[Active members: Green, Blue, Yellow, Red, Purple]												
AGM	[Active members: Green, Blue, Yellow, Red, Purple]												
Trials	[Active members: Green, Blue, Yellow, Red, Purple]												
Monitoring and Evaluation	[Active members: Green, Blue, Yellow, Red, Purple]												
Club Meeting	[Active members: Green, Blue, Yellow, Red, Purple]												
Registration	[Active members: Green, Blue, Yellow, Red, Purple]												
Player Cards	[Active members: Green, Blue, Yellow, Red, Purple]												
League Structure	[Active members: Green, Blue, Yellow, Red, Purple]												
Fixtures	[Active members: Green, Blue, Yellow, Red, Purple]	[Active members: Green, Blue, Yellow, Red, Purple]											
Log	[Active members: Green, Blue, Yellow, Red, Purple]	[Active members: Green, Blue, Yellow, Red, Purple]											
Tournaments	[Active members: Green, Blue, Yellow, Red, Purple]	[Active members: Green, Blue, Yellow, Red, Purple]	[Active members: Green, Blue, Yellow, Red, Purple]									[Active members: Green, Blue, Yellow, Red, Purple]	[Active members: Green, Blue, Yellow, Red, Purple]
Referrals	[Active members: Green, Blue, Yellow, Red, Purple]												
Check Cases	[Active members: Green, Blue, Yellow, Red, Purple]												
Player Transfer	[Active members: Green, Blue, Yellow, Red, Purple]												
Field Maintenance	[Active members: Green, Blue, Yellow, Red, Purple]												
Liaise with Stakeholders	[Active members: Green, Blue, Yellow, Red, Purple]												
Monitor Leagues	[Active members: Green, Blue, Yellow, Red, Purple]	[Active members: Green, Blue, Yellow, Red, Purple]											
Communication	[Active members: Green, Blue, Yellow, Red, Purple]												
Renumeration	[Active members: Green, Blue, Yellow, Red, Purple]	[Active members: Green, Blue, Yellow, Red, Purple]											
Purchases	[Active members: Green, Blue, Yellow, Red, Purple]												

Depicted in Table 18 above is a description of the relative workload of the five active members within the Makana LFA. It is important to note that the purpose of such a diagram is not to make sense for outside readers necessarily but to allow SMEs to conceptualize the workload among committee members within the Makana LFA. Importantly, a number of activities involve collaboration amongst all members, such as the mobilization of resources, liaising with stakeholders and monitoring and evaluation. In addition, several time-consuming activities associated with running the leagues are performed by the three members involved with the competitions committee.

More specifically, all active members contribute to the following activities: meeting, mobilizing resources, the AGM, monitoring and evaluation, club meeting, tournament, liaising with stakeholders, and communication. These findings allow for the categorisation of activities according to portfolio to represent workload demands. For example, the treasurer, general secretary and competitions members are involved with the majority of tasks. The treasurer is required for all activities other than checking cases. Similarly, the general secretary is involved with all except affiliation and checking cases. The general member is involved with player cards, league structure, log, referrals and monitor leagues. The local member contributes to check cases and field maintenance, while the vice-chairperson is involved with affiliation, check cases, remuneration and purchases.

According to the SMEs, there are several emergent constraints on the system due to the volunteer nature: Firstly, considering the volunteer nature, SMEs indicate that there is a sense of unrealistic expectation on those within the system. Secondly, the lack of resources results in higher time demands to compensate. There is significant pressure applied from stakeholders such as clubs who do not have insight into the challenges associated with administrators within the Makana LFA. Thirdly, according to SMEs, an additional constraint is the lack of administrative skills possessed by administrators. This further adds to the time burden as members attempt to understand their responsibilities. This leads to discontent due to under-appreciation as well as errors in administration,

which are often fixated on by others. As a result, there is a general lack of empathy for administrators who feel undervalued.

Work as Imagined

The SOCA-CAT associated with the work as imagined perspective is a graphic representation of the suggestions of subject matter experts for how to improve the functioning of the Makana LFA (Table 20). The conceptual model itself is, therefore, a significant finding, demonstrating the SME perspective to how the Makana LFA should distribute its work at this community level. The addition of function in the form of committees aims to improve the workload distribution amongst active committee members. There is also a reliance on increased committee numbers, which will be engaged in the constraints and affordance section. Furthermore, the inclusion of new activities within the WDA result in these responsibilities being distributed accordingly, in line with the WDA. The image above, therefore, represents the ideal distribution of work across the year, with each committee responsible for their corresponding activities. Meetings and communication are important for all committees concerned (Indicated in grey). The distribution can be seen in Table 19 below.

Table 19: Distribution of committee work for the Makana LFA as proposed by subject matter experts.

<u>Committee</u>	<u>Colour</u>	<u>Activities</u>
Executive	Blue	Affiliation, mobilization of resources, AGM, monitoring and evaluation, liaising with stakeholders, remuneration, purchases and funder identification.
Competitions	Green	Club meeting, registration, players cards, league structure, fixtures, logs, tournaments, player transfers, monitoring leagues
Discipline	Yellow	Monitoring and evaluation, referrals, check cases

Referee	Orange	Monitoring and evaluation, fixtures, tournaments, field maintenance, monitor leagues
Emergency	Red	Not indicated, Responsible for immediate decisions due to emergent issues
Development and Women's Football	Purple	Tournaments, liaising with stakeholders.
Fundraising	Light Blue	Mobilize resources, liaise with stakeholders, awards event, funder identification, sponsorship proposal
Media	Brown	Media Management
Advisory	No Colour	Not indicated. Requested by the executive

Table 20: SOCA-CAT for work as imagined of the Makana LFA. Colours denote active committee members. Legend can be seen in Table 19.

Activity/Time	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
Meeting	[Grey bar with white circle in August]											
Affiliation	[Blue bar with white circle in August]											
Mobilize Resource	[Blue bar with white circle in February]											
AGM	[Dark blue bar with white circle in August]											
Trials	[Purple bar with white circle in September]											
Monitoring and Evaluation	[Yellow bar with white circle in February]											
Club Meeting	[Green bar with white circle in August]											
Registration	[Green bar with white circle in August]											
Player Cards	[Green bar with white circle in August]											
League Structure	[Green bar with white circle in September]											
Fixtures	[Green bar with white circle in October]											
Log	[Green bar with white circle in February]											
Tournaments	[Striped bar with white circles in August, September, October, March, April, May]											
Referrals	[Yellow bar]											
Check Cases	[Yellow bar]											
Player Transfer	[Green bar with white circles in August and February]											
Field Maintenance	[Orange bar with white circle in August]											
Liaise with Stakeholders	[Striped bar with white circle in August]											
Monitor Leagues	[Striped bar with white circle in February]											
Communication	[Grey bar with white circle in February]											
Remuneration	[Dark blue bar with white circle in June]											
Purchases	[Dark blue bar with white circle in August]											
Awards Event	[Blue bar with white circle in June]											
Funder Identification	[Blue bar with white circle in August]											
Sponsorship Proposal	[Blue bar with white circle in August]											
Media Management	[Brown bar with white circle in February]											

Strategies Analysis – Work as Disclosed and Work as Imagined

For the work as disclosed, each activity was dissected to create a comprehensive understanding of the work associated with the LFA. Distinct categories to engage with each activity were developed. These categories were as follows: 1) Purpose of the activity 2) Needs of the activity 3) Challenges associated with the activity 4) Strategies to complete the activity. The complete summary of discussions can be seen in appendix 9. This is for ease of interpretation of results as the discussions were extensive. Following analysis, constraints for each activity were lifted from this summary and then confirmed by SMEs. Within work as imagined, each constraint was then discussed, with a relative strategy developed to mitigate the impact. Numerous opportunities were also noted throughout the previous analysis steps. It was, therefore, necessary to consider affordances, additional options and expansions of LFA operations. A strategy to employ each of these affordances was also developed and can be seen in the table on page 124.

There is a significant challenge in presenting results for the strategies analysis phases of CWA application. For ease of analysis, WADi and WAP are combined to link constraints and resulting strategies developed during WAI. Similarly, with affordances, their description and strategy, informed by the WAI discussion, are indicated in the following tables.

Table 21: Constraints identified within Makana LFA and the related strategy recommendation.

<u>Constraint</u>	<u>Description</u>	<u>Strategy</u>
No Office or Storage	This is a considerable burden for the LFA. Not having a centralized office means SMEs don't have a home base for meetings, don't have somewhere to store equipment and resources, and don't have somewhere to build up our image and create a professional culture.	The strategy is to persuade/negotiate with the municipality or Rhodes University to provide us with office space. This relates to stakeholders' relations which, due to the resource-scarce nature of the organization, is paramount.
Minimal Sponsorship	The typical approach to sponsorship has been that it is the treasurer's portfolio. However, due to the workload and lack of active committee members, this often gets overlooked due to more practical immediate issues.	The proposal is that all members should take responsibility for sponsorship and assist with identification and engagement with stakeholders. This issue of fundraising is of such importance that an additional function was added to the WDA, to engage with this considerable constraint. Adjustments sponsorship documents should be made, with the inclusion of quotations. Official documentation and personal visits are vital.
Fundraising	This point links to sponsorship. The LFA is underfunded and under-resourced. Crucial that everyone in the administration takes responsibility for the development of funds and resources for the betterment of local football.	More proactive approaches to fundraising are needed—activities such as fun runs, tournaments to raise funds for the LFA etc. We should also be engaging with larger stakeholders, such as the new year's cup.
Lack of Assets	The Makana LFA has a lack of inventory items that are required for effective functioning. Administrative equipment as well as matchday and training equipment is needed. However, these are expensive, and we rely on other stakeholders to contribute.	The additions of sponsorship and office space will allow for the consolidation and expansion of resources. The LFA predominantly spends its resources on consumables, which must be adjusted. Executive members require access to the internet. Airtime should be budgeted for, particularly for secretaries or general administrators. We should also look into Rhodes internet, which has some Hubs in JOZA.

No Meeting Venue	The LFA does not have a venue, and so it relies on stakeholder resources. We currently utilize BAB (a municipal building), public schools or pay for private venue hire. There is no formal relationship.	Formalizing relationships with stakeholders, and developing MOUs to use additional venues is a priority. We need to spread the use of venues, so we don't overburden a single stakeholder and consider the other uses of facilities.
Few committee members (Inactive members)	In terms of everyday functioning, there is no more important point. The lack of committee members results in excessive workload and often, errors in administration. There is a need to recruit more members.	Aspects such as incentives have been discussed, e.g., monetary or skills-based. We have also spoken about the challenges in recruiting new members which will be discussed in a later phase of the CWA. This is a difficult issue to engage with, as it is influenced by broader systemic factors.
Administrative Competence	There is a lack of knowledge and administrative qualifications in the LFA.	The LFA needs to discuss with DSRAC about opportunities for administrative courses to increase the capacity of the executive committee. We should write a letter to DSRAC about an accredited course for all members. This would be useful to referees and clubs as well.
Club Resources	<ol style="list-style-type: none"> 1. Minimal Sponsorship/No Funding: Similar to the LFA, the clubs have minimal resources and infrastructure. This, in turn, affects the administrative functioning of the LFA. There are some clubs that have sponsors. This may influence the sponsors available to the LFA as there are few sponsors in Makhandha. 2. Minimal Equipment: Links to the previous point on the approach to sponsorship for local clubs. 3. Few Football qualifications 4. Few Administrators (No club structure) 	<ol style="list-style-type: none"> 1. LFA must insist on a letter of endorsement, following an application by Clubs. We must know what sponsorships are associated with local football. It could be argued that the LFA needs the sponsorship more than clubs. Resources must be harnessed for the betterment of the football community. 2. DSRAC is a stakeholder providing sponsorship to local teams. We need to ensure that we spread these available funds across the LFA, allowing for all clubs to develop. 3. Capacity building courses for administrators and coaches alike. We need to approach both DSRAC and Rhodes to see what courses can be afforded to

	<p>5. Lack of Technological Access and Awareness: Clubs do not have technological resources. Their administration is therefore challenging.</p> <p>6. No bank accounts</p>	<p>members. Also, potentially, the SAFA Sarah Baartman region.</p> <p>4. Similar to the previous point. Upliftment and opportunity for local members. Community development</p> <p>5. There are most likely club members with these resources. Clubs should be ensuring that those players are utilized as administrators.</p> <p>6. Clubs must ensure their administration is in line with the SAFA documentation.</p>
Complex Documentation	<p>Non-compliance is a significant concern. This is informed by the lack of English speakers in this context, as well as the education level of the majority of members.</p>	<p>After much discussion, it was suggested that simplified documentation should be created, more appropriate for an LFA level.</p> <p>Some amendments to policy:</p> <ul style="list-style-type: none"> • The cost of disputes and complaints is exorbitant and not possible at this level. It results in administrative issues. Should be drastically reduced. • Specific to LFA level. It is currently based on national-level policy. • NQF level 4 is an appropriate level to aim the documentation.
Affiliation	<p>A significant issue is late affiliation payments by clubs which delays the league.</p>	<p>The proposal is to institute a fine for late payment, as a corrective measure to the clubs. R200.</p>
No auditors	<p>Auditing is needed to make a fundraising application to large organizations such as the National Lottery Fund. The LFA cannot afford the costs associated with auditing.</p>	<p>Pro-bono options are required. Rhodes University seems well placed to assist, perhaps Rhodes University Community Engagement.</p>

Player Registration	<ol style="list-style-type: none"> 1. This is a significant administrative load on the competitions committee. As a result, administrative errors are common. 2. Incomplete registration forms are a major constraint. The medical form is a challenge for clubs. 	<ol style="list-style-type: none"> 1. The introduction of the MYSAFA system will make administration easier. An example of a match report and other documentation should be circulated. 2. In the future, we need to look into having doctors/nurses made available to support the teams with medical evaluation.
Record Keeping	Poor record-keeping is due to a lack of resources available to the LFA, both in terms of technology such as computers and WIFI etc. and human resources.	The introduction of MySAFA should assist with documentation, including player transfers.
Disciplinary Cases	This is typically due to the poor functioning of the referee committee. Inconsistencies when it comes to reports and DC cases. Clubs also do not fully understand the constitution and uniform rules.	Referees should be workshopped on how to complete the match report effectively. The same goes for coaches, so there is engagement with constitutional issues.
Undermining of Leadership	Personal politics are a significant issue within the LFA.	To avoid controversy, the LFA must stick to the constitution. It is also crucial that committees or members not make decisions that are outside of their mandate or leak information to clubs that is not up for discussion.
Literacy	Documentation associated with LFA and related to SAFA in general is English speaking and also has high-level jargon and terminology. The language spoken at most meetings is isiXhosa.	It is not appropriate for a country with 11 official languages and diverse education ranges. As a result, simplified local documentation aimed at NQF level 4 would be suitable. Currently, translation, tolerance and patience are needed by other committee members who are first language isiXhosa.

Lack of Referees	A major challenge is the abuse of referees on and off the field. R30 is received per game from each team. Coaches blame referees for decisions, resulting in reduced referee numbers.	Incidents need to be reported by the refs. LFA must act and fine those responsible. A further challenge is that refs react differently to incidents. Young refs are a problem as they are inexperienced. The LFA must facilitate their learning, utilizing workshops. Engage with SAB referees to assist as mentors for referees. The referee committee must function effectively.
Stakeholder Support	No documentations or agreements with stakeholders and a word-of-mouth culture. Disorganization, lack of records, blame culture.	The LFA needs more formalized relationships with its stakeholders, setting out roles and responsibilities. Stakeholders discussed at a later phase.
Committee Members	Not staying for their tenure. Sudden resignations and inactivity.	<ol style="list-style-type: none"> 1. Significant administrative burden during registration and early periods in the season. It is suggested that volunteers' members assist for that period, after which they are not under obligation to stay within the committee. 2. An idea for the election of the executive committee. Only a chairperson is selected according to position. The other members of the committee are voted in, but then their roles and responsibilities are decided by the committee itself, to analyse the relevant skills and optimize the jobs or tasks being done by committee members. 3. We need to educate clubs, so they make informed decisions at the electoral congress.
Communication Breakdowns	Communication within committee and information sharing to the clubs is a significant issue.	MYSABA makes league organization, access and communication much easier. We need to keep our social media presence and update more consistently. In terms of official communications, these come from, the secretaries. Transparency and timeliness are crucial.

Poor Region Organization	The region has a significant impact on the functioning of the LFA due to the program and fixtures it releases and other performance issues. This is a difficult constraint to rectify.	We must stick to the constitution and ensure we follow the SAFA mandated documentation.
Competitions Committee Workload	Competitions committee is overworked.	<ol style="list-style-type: none"> 1. MYSAFA will drastically reduce the administrative workload once players are registered in the system. We should use volunteers during this initial period. 2. We need more general members. 3. HKE students to perhaps get involved.
Lack of Fields	<ol style="list-style-type: none"> 1. We only have JD Dlepu Stadium. Issues with double bookings of fields, demands on the field. 2. Lack of security and safety. 3. Lack of maintenance. 	<ol style="list-style-type: none"> 1. Need better arrangements with the parks department—transparency over the schedule and our use of the field. 2. Difficult as the South African Police Services (SAPS) and Emergency Medical Services (EMS) are not a realistic proposition. Additional stakeholders such as Rhodes may assist with first aid. 3. Stakeholders are key here. We need MOU's regarding our use of community facilities.
No Player database	No knowledge of registered players.	MYSAFA will solve this issue.
Late league start	Delays due to factors such as late affiliation, registration and disciplinary issues.	Fines for late affiliation. Pre-empting factors and setting the deadline early.
Dysfunctional Referee Committee	There is a significant issue with match day administration and reporting.	Reform the committee. Include referees in the committee. Set up the relevant procedure. We must enforce misconduct and be strict about behaviour on the field. The disciplinary committee could be more active to instil the appropriate culture.

Teams dropping out of the leagues	Significant administrative issues due to noncompliance of clubs.	Propose to institute a fine system for clubs that fail to honour their fixtures.
Fixtures schedule	Some periods during the season where you cannot fixture games due to factors such as Clubs requesting a postponement, other activities and initiation.	We must follow procedure. The emergency committee needs to be formed by the LFA chairperson and the decision ratified. This is the case for general fixture postponements as well. Initiation (June and December) – take into account.
Media Interference	Negative Press from local media outlets.	Meet with Grocotts (Local media) – Negotiate a positive relationship. We must respond to the positive and engage with social media contact.
Poorly defined committee roles	Competitions take a fundamental role and cover for other dysfunctional committees.	We must develop a survival guide for each committee. Each committee to develop an instruction manual. This is to ensure effective handover and to allow for continuity.
Lack of legal Expertise	Non-compliance with SAFA documentation.	Not an issue right now as we have sufficient experience. But a consideration for future committees. We need a survival guide for the future.
Player Transfers	Issues of compensation.	MYSAFA will solve transfer disputes. R500 is an issue. We must develop executive resolutions and amendments to the policy. This is then subject to approval at the AGM.
Lack of prizes as incentives	Impact on community motivation and involvement in grassroots football.	Sponsorship – we need to redo our forms and applications.
Approval of emergency payments	Time constraint decisions often place pressure on single committee members.	Emergency Committee (Chair, secretary and witness, Led by the LFA chairperson).

Referee payments	Issue of Payment at the field. R30 (\$1.73) is required from each team per game. Often leads to disputes.	Perhaps clubs should pay the LFA for the season in terms of referee payments. This requires the referee committee to be in order so that the referees are highly professional. This would reduce clubs dropping out as they would have already paid for the referees. It would help coordinate the referee payments, and we would have more control.
Injuries	Injuries on the field are a significant issue due to the lack of EMS support.	A medical form is needed for player insurance. <ul style="list-style-type: none"> • First Aid assistance from Rhodes University.
Clubs arriving late at Games	Still demanding to play. Soft points and disputes on the field.	Issue of fixture changes. Always shift games forward. Wednesday is the latest that notice can be served of fixture changes. Stick to the constitution.
Committee team building	Important that the committee has some team building activities to bring them together and have a common goal. Reduces issues such as information leaking etc.	Schedule specific events and awards for committee members.
Clubs electing competent committee members	Challenges for new committee members (Volunteer status, lack of incentive).	Nothing we can really do at this point. Future stipend for general secretary Two-sided coin as if there was an incentive, this may change the type of person who joins. We value dedication and passion
SAB clubs undermining LFA	Increases administration.	Bring them into line through the constitution. This also includes referees who officiate at a SAB level.

The table above presents the constraints identified by Subject Matter Experts during the work as disclosed conceptual modelling. Cognitive work analysis provided the platform for the identification of 40 overall constraints. These can be categorized into seven broad constraints as follows:

1) Lack of Active Committee Members. SMEs noted that there are significant human resource constraints. Committee members often do not fulfil their tenure, and active members find it difficult to recruit committee members for standing committees.

2) Limited Qualification/Experience. Linking to the previous points is the lack of administrative and soccer-specific qualifications within the volunteer group. The lack of experience and expertise results in challenges for administration.

3) Lack of Funding. Makana is a poorly resourced area, and so the LFA struggles to get sufficient funding. As a result, there are minimal financial incentives (e.g., Prize money, stipend etc.) for clubs and administrators alike.

4) Lack of Assets. Influenced by the lack of funding, the Makana LFA does not have sufficient resources such as fields, referee equipment and administrative equipment. The fields that are within the system are poorly maintained.

5) Complex Documentation – Instruction for the functioning of LFAs from the governing body SAFA requires a high level of English literacy, which is not typical within this context.

6) Competitions Workload. The competitions committee adopts several roles and is vital for the functioning of the LFA. As a result, there is a high expectation of committee members and unequal work distribution.

7) Club Attitudes and Culture. There is often conflict between administrators and clubs due to the previously mentioned constraints. This creates a combative environment which is not constructive. Conflict management is an important job within the LFA for administrators.

Table 22: Identified affordances for the Makana LFA and associated implementation strategy

<u>Affordance</u>	<u>Description</u>	<u>Strategy</u>
Modernization of clubs	Administration requires clubs to be technologically aware.	<ol style="list-style-type: none"> 1. Clubs need email addresses. The committee can assist with starting up those accounts. 2. Clubs must establish leadership and communication.
Capacity Building	Upskilling of committee members and football community members.	Engage with stakeholders and negotiate courses and upskilling opportunities. Particularly Rhodes and DSRAC.
Increased tournaments	Financial incentives and to provide interest and motivation to players.	<p>Tournaments: Build it u13, Heritage u15, New Year's Cup, Engen, Easter Weekend Tournament (Club to organize), National Arts Festival 5-a-side, Top 8.</p> <p>Resolutions</p> <ol style="list-style-type: none"> 1. Each division should have a tournament. 2. This should take place prior to the start of each division to get clubs going on registration and organization. This will make the leagues function more effectively.
Extra charge for late affiliation	Reduce delays and non-compliance.	<ol style="list-style-type: none"> 1. Proposed for next AGM. 2. Also, propose that referees' payments be made at the start of each season. Improves respect and organization of referees.
Develop simplified documentation for clubs	Allow for clubs to engage with the constitution and their responsibilities. Improve administration.	<ol style="list-style-type: none"> 1. Amendments to policy documentation. 2. Documentation or survival guides for committees.

Auditors	Assists with funding applications.	Rhodes University Accounting department can perhaps assist as a service-learning opportunity.
Develop a Makana LFA squad	Encourage social cohesion and talent identification with the community.	This has significant challenges. Nothing we can do right now. Perhaps in the future. Requires coordination with Region for opponents etc.
MYSAFA	Allow for easier monitoring and evaluation.	Will solve a number of issues such as workload, registration, player transfer and status etc. The guidebook for competitions needs to include all the relevant instruction and login details.
Engage with stakeholders	Need for support and improved coordination with stakeholders.	Formalize roles and responsibilities: consistent meetings and transparent communications.
Awards Dinner	Provide a sense of accomplishment and incentives for clubs.	<ol style="list-style-type: none"> 1. Need to make this a yearly occurrence. Include all contributors to local football. 2. Should have long service awards etc. to show thanks to members of the community who make significant contributions to local football development. 3. League Winner Wall: In line with incentive etc., we should create a league winner wall at JD. Then everyone can see who has won etc. and have pride and try to get their team on the wall. Also, look into graffiti to make JD more of a hub. We must seriously look into getting authority over the stadium, and then we can look into businesses fixing some of the broken aspects and then sorting out the field etc.
Punishment for clubs dropping out	Reduce delays to league.	Financial fine for clubs. We should make this explicit to clubs and send them all a warning letter. This has a significant impact on the league and must be resolved.

Survival guide	Workshop for clubs to explain rules etc. Improve documentation and record-keeping.	Develop the survival guides for each committee. Revise policy and develop simplified documentation.
Fine misleading players	Reduce transfer issues.	Misinformation: Disciplinary Committee to act if sufficient evidence. Protect the integrity of the association.
Fundraising	Creates opportunities for local football community.	We need to look into more permanent sponsorship. Then we can invest in infrastructure (Lotto applications, Franchises (KFC), Local Businesses, Banks, Siyakubonga).
Control at JD Stadium. Charges for entry	Generate funds, control facilities.	<ol style="list-style-type: none"> 1. Security is an issue. JD needs to be secured before we can do anything. By the municipality. <ol style="list-style-type: none"> i. JD Stadium as the football hub (Labour and maintenance, Meeting with the municipality, BUCO/Build it to support securing). ii. The caretaker building should be for the LFA. iii. Painting of walls. iv. Clean up field. v. Flatten pitch. Additional 5 a side pitch.
Uniform for committee members e.g., tie	Reward and authority for committee members.	Important for committee pride. We should create tie with LFA Logo. Everyone can then have the same uniform.
Changing youth leagues to an alternative venue	Managing facilities and reducing wear and tear.	The field next to Mkili Yili. We are waiting for poles from DSRAC.
Engage with Ward Councillors	Engage with community and share assets.	<ol style="list-style-type: none"> 1. Approach about office space. 2. Send a letter.

Stipend for general secretary	Support the administrative load on members.	Reward those who are dedicated.
Team sheets	Need for improved matchday reporting.	Perhaps the referees should have the team sheets for each game. Printing – give to clubs. Then charge clubs for additional documentation needs. No team sheet, no substitutions etc.
School football	Vital feeder for development.	We should engage with DSRAC on this as they operate with school sport—more of a long-term aim.
New year's cup	National tournament held in our town. Foster improved relations.	Entrance fee to the venue. <ul style="list-style-type: none">• We should push the new year's cup into contributing to us and local football development.
African connection	Improve women's football development.	We should meet with African connection. They must affiliate and then we can integrate.

Throughout both work as disclosed and work as imagined, a number of affordances were identified by subject matter experts. These can be seen in Table 22 above. Identified affordances are highly specific to the Makana LFA context. However, these can be demonstrated through broader categories.

1) Modernization of Clubs. Technological advancements mean that there are opportunities to make administration much easier for committee members. This may improve communication, league management and registration requirements.

2) Increased tournaments. Subject matter experts indicated that league competition might result in decreased motivation for clubs. Providing knock out tournaments improves immediate interest and serves as a fundraising opportunity.

3) Constitutional adjustments. There is a need to improve the compliance of clubs through a fine system. Furthermore, protests and appeals cost are exorbitant, and are not appropriate for the community level.

4) Survival guide. To improve compliance by clubs and LFA committees, SMEs suggested the construction of survival guides that provide a framework for the execution of relevant tasks.

5) Stakeholder Engagement. The resource-scarce nature of Makana requires the attainment of resources through additional stakeholders. It is necessary to improve relations with identified stakeholders.

6) School football. There is minimal structure to school sport in Makana. To improve development and feeders into the LFA, engagement with school structures is recommended.

Stakeholder Identification

Subject matter experts note that stakeholders are a vital resource for the growth of the LFA. This is due to the under-resourced nature of the LFA and high reliance on additional resources from other stakeholders. Discussions were, therefore facilitated to identify potential stakeholders within the Makana Municipality. Consequently, the potential contribution of each

stakeholder was listed, informed by previous experience with those stakeholders. Thus, an important finding of the current study are the relevant stakeholders within the sociotechnical system of the Makana LFA and what they could potentially contribute to local football development. These are indicated in Table 23 below.

Table 23: Identified stakeholders and their potential contributions to the Makana LFA

<u>Stakeholder</u>	<u>Potential Contribution</u>
The Sarah Baartman Department of Sports, Recreation, Arts and Culture.	<ol style="list-style-type: none"> 1. Office space and equipment 2. Printing 3. Awards and sponsorship 4. Transport 5. Venues
Makana Municipality Parks Department.	<ol style="list-style-type: none"> 1. Field maintenance
The Department of Human Kinetics and Ergonomics Department, Rhodes University.	<ol style="list-style-type: none"> 1. Youth development project. 2. Administrative volunteers 3. Internet/WIFI 4. Stationary 5. Venues
Sarah Baartman SAFA Region.	<ol style="list-style-type: none"> 1. Upper body, oversight on the LFA. 2. Funding, highly unlikely. 3. Compliance to SAFA organisational structure.
6 South African Infantry Battalion.	<ol style="list-style-type: none"> 1. Donation of poles 2. Fields 3. Equipment
Rhodes University Sports Administration.	<ol style="list-style-type: none"> 1. Fields 2. Branding 3. Capacity Building

	<ul style="list-style-type: none"> 4. Office Space 5. Equipment (First Aid Kit)
National Arts Festival.	<ul style="list-style-type: none"> 1. 5 – a side Tournament
Schools (Kutliso Daniels, Nombulelo, Ntsika, Mrwetyana).	<ul style="list-style-type: none"> 1. Meeting Venues 2. Fields
Fort England.	<ul style="list-style-type: none"> 1. Fields
Municipality (Infrastructural).	<ul style="list-style-type: none"> 1. BAB Boardroom for meetings 2. Ward councillors 3. Potential Office

Worker Competencies Analysis (WCA)

When considering the context, definitive Skills, Knowledge and Rules (SKR) associated with this system may not be relevant due to the volunteer nature of committee members. Further, as outlined in the review of literature and methodology, such a context does not allow for one to be prescriptive but rather to work within the constraints of the system, create strong relationships and build towards capacity building once these have been established. One cannot dictate the skills of a volunteer. Committee members must be flexible as they perform a large variety of tasks across the system. Therefore, following discussion with SMEs, it made more sense to look for characteristics of a general member. What qualities and skills are important? Then the committee can look at ensuring passionate people have the basic skills to complete the required tasks. SMEs discussed the merits that, in our view, are important within general members, both executive and standing committees. We then indicated more specific skills for the specialized positions of Chairperson, Deputy, Secretary and Treasurer.

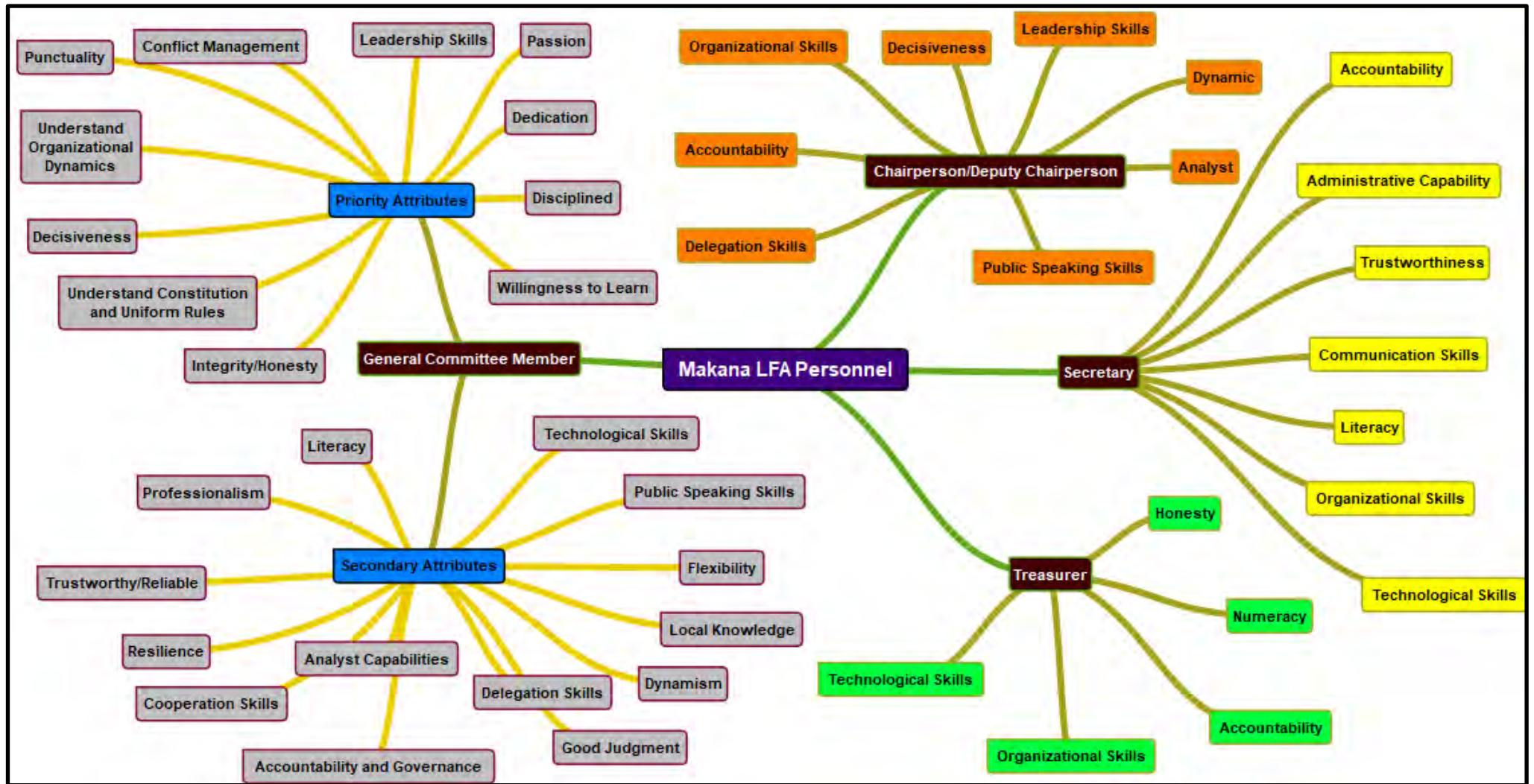


Figure 9: Mind map of psychosocial qualities of Makana LFA committee members

Identifying Mismatches (WAP vs WADi)

It is pertinent to engage with the comparison of the WDA for both work as prescribed and work as disclosed to identify any mismatches between how work is envisioned (WAP), and how it is performed by SMEs (WADi). This may inform potential redesign as there are implications for mismatches across levels of the WDA. The implications of this will be unpacked in the discussion section of this thesis. Important mismatches were identified between the two perspectives, including the following:

- 1) Difference in Purpose** – SMEs denoted differing purposes to that recorded from related SAFA documentation.
- 2) Discrepancy in functions** – Reduced number of functions occur for work as disclosed when compared to work as prescribed, influencing workload distribution and organizational compliance.
- 3) Resource description** – Work as disclosed described resources required for the Makana LFA while work as prescribed denotes few resources. Furthermore, SMEs note an inability to access resources that they perceive they require.

These findings will be reported as per the hierarchical abstraction associated with WDA. The mismatches have been demonstrated graphically in the corresponding figure (Figure 10). It is a composite conceptual model of the work domain analyses, including both work as prescribed and work as disclosed. This aims to emphasize the differences that exist between how work is prescribed and how it occurs according to subject matter experts. Connections within the conceptual model carry less meaning due to the composite nature. The table below serves as a legend to explain the colour coding.

Table 24: Colour legend for composite work domain analysis diagram.

<u>Level of Abstraction</u>	<u>Node colour</u>	<u>Description</u>
<u>Fundamental Purpose</u>	White	Purposes prescribed by SAFA
	Indigo	Purposes identified by Makana LFA subject matter experts
<u>Values and Priorities</u>	Fern	Values of the system indicated by SAFA
	Light green	Overlapping values between both perspectives
	Pale green	Values within the Makana LFA not stated by SAFA
<u>Functions</u>	Blue	Functions that are present for both perspectives
	Red	Functions prescribed by SAFA that are not operational within the Makana LFA
<u>Activities</u>	Dark blue	Activities listed that correspond for both perspectives
	Diamond shaped dark blue	Activities adopted by the competitions committee that are prescribed by SAFA for a different function
	Green	Activities that are present in the Makana LFA but not prescribed by SAFA
	Orange	Activities prescribed by SAFA that do not take place in the Makana LFA
<u>Resources</u>	Light Yellow	Resources noted within work as disclosed
	Maroon	Overlapping nodes between both perspectives

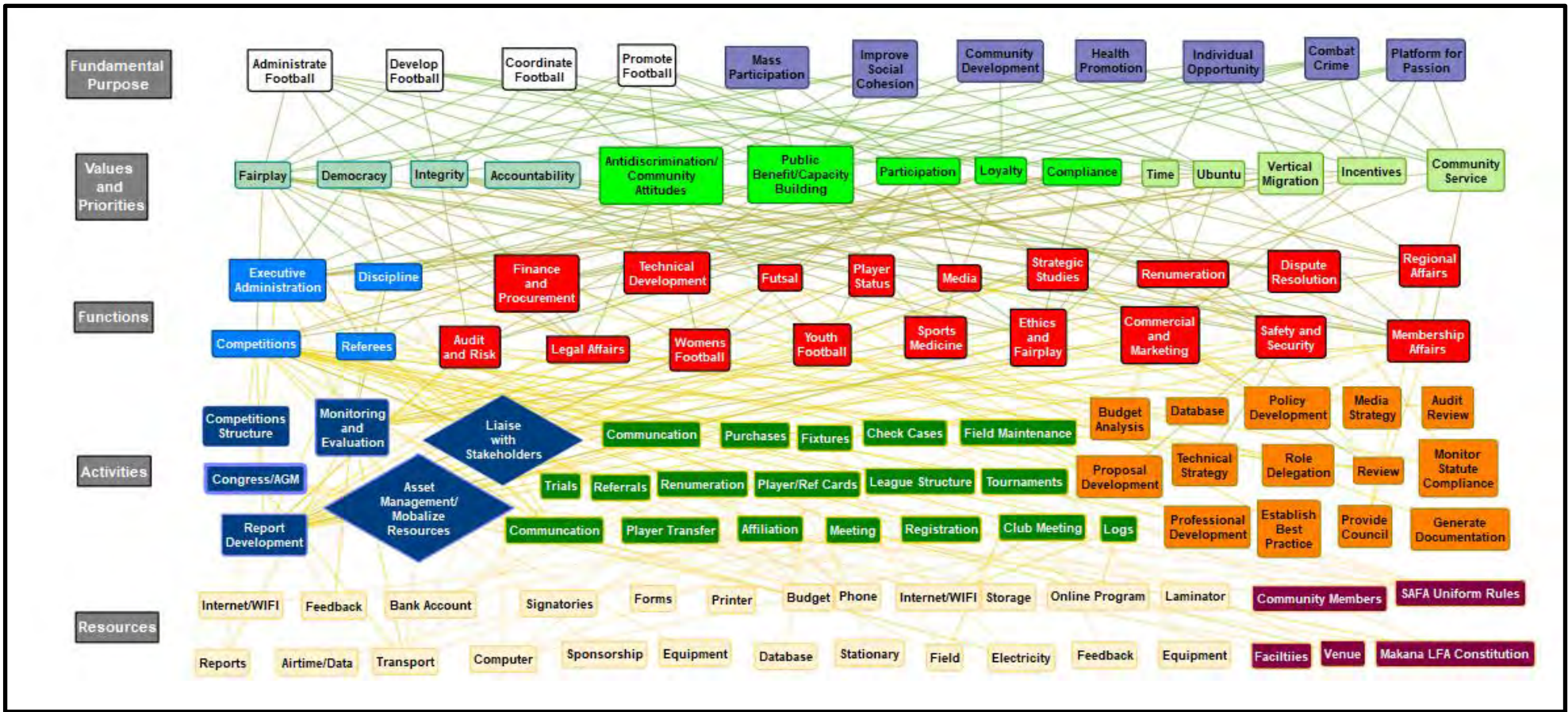


Figure 10: Composite work domain analysis of work as prescribed and work as disclosed

The composite diagram above represents the mismatches between the perspective of the governing body SAFA according to prescribed documentation and the perspective of how the Makana LFA currently functions according to active committee members. For the functional purpose and value levels, work as prescribed is indicated on the left-hand side of the diagram, with additional nodes of work as disclosed on the right. For the functions level, nodes of the work as prescribed perspective are listed, with those that are actually performed according to SMEs highlighted. At the activity and resources level, SME perspectives are indicated on the left, with nodes associated with the work as prescribed listed on the right. This format aims to highlight both constraints and affordances highlighted through WDA application. The identified mismatches have important implications for the functioning of the Makana LFA sociotechnical system and will be noted according to the abstraction hierarchy of the WDA.

Fundamental Purpose

Crucial differences were identified between work as prescribed and work as disclosed. WAP places significant focus on football, its growth, and effective administration, while for WADi, there is an acknowledgement of the more substantial role that the Makana LFA plays in South African society. Work as disclosed does acknowledge the importance of the growth of the game and administration through mass participation but instead values compliance as the link to effective governance. For WADi, subject matter experts note the fundamental purpose of the Makana LFA as a platform for social cohesion, encouraging social integration in post-apartheid South Africa.

Furthermore, at this level of local football, the importance of contributions to the socioeconomic status of community members is highlighted with a primary aim of the Makana LFA to provide opportunities to its members through community development. Interestingly, local football serves as a positive platform at an individual level, particularly for the youth. The promotion of health and providing a platform for members to follow their

football passion are fundamental purposes, further linking to broader socioeconomic benefits.

An important finding of the present study is that the Makana LFA serves as a tool to combat crime, encouraging community members into more constructive activities, reducing the likelihood of these members falling into the prevalent drug and crime culture. This is not highlighted in the SAFA purposes of the LFAs. It is clear from the WDA analysis that the LFA has a different role in South African communities than those outlined by SAFA in WAP.

Values and Priorities

There are commonalities in values such as compliance and increased participation. SMEs view higher numbers of players, clubs, administrators, referees etc. as a positive indication of the efficient functioning of the LFA. This allows for growth, promotion, and development of the game, consistent with the WAP perspective. Furthermore, from the perspective of subject matter experts, effective administration is achieved through compliance with SAFA documentation and the relevant organizational structure as dictated by the LFA statute document. SAFA also values compliance. Additional values are similar across the two perspectives. Fairness, equality, anti-discrimination, and democratic values within WAP link to the attitudes to other community members' value described by WADi. Fundamental aspects such as dedication and loyalty also demonstrate how the Makana LFA should operate and is consistent for both perspectives.

Some aspects that differ when engaging with WADi are the importance of socioeconomic benefits to those that contribute to grassroots football. According to SMEs, providing incentives to community members is vital to improving the community, while it is important to acknowledge the positive roles that community members play through service to the football community.

Interestingly, at the value level of the WDA, it is evident that there are similarities across both perspectives. The adoption of democratic values, fairness, and equality as well as compliance, are present for both the work

as prescribed and work as disclosed perspective. SMEs noted that such values are adopted from SAFA related documentation. These values, therefore, reinforce the importance of prescribed documentation and the oversight role of SAFA over its LFA infrastructure.

Functions

There is a significant discrepancy between Work as prescribed and Work as disclosed concerning the functions and distribution of work within this sociotechnical system. The work as prescribed from SAFA documentation revealed 22 functions associated with the LFA. However, only four of the recommended functions are actually performed within the Makana LFA: Executive administration, competitions, referee logistics, and discipline. This is due to inactive committee members and a general lack of financial and human resources. Furthermore, there is an imbalance in the number of activities associated with each function. This is represented through means-end link analysis, demonstrating that the competitions committee is fundamental to operations of the LFA. It is responsible for the majority of tasks indicated through the means-end link approach. This is in contrast to the distribution of roles according to SAFA's top-down perspective.

An important finding of the study, due to the mismatches highlighted above and through observations by the SMEs, is the general mismatch in function. There is significant non-compliance, which is justified by SMEs within the setting. However, these could be highlighted as poor management, which can then be used to undermine the administration. These subjective judgment calls make administrators liable, rather than viewing them as effective problem solvers. According to subject matter experts, an opportunity exists to provide administrators with greater autonomy to design the system, depending on what is available and subject to constitutional agreement.

Activities

As consistent with the function comparison, there are significant differences between the activities laid out in the WAP perspective (SAFA) and those

identified within work as disclosed. WAP notes generic activities associated with each of the 22 functions, while activities for WADi are detailed and directed based on the four operational functions. For WADi, there is a greater emphasis on the competitions committee, which performs the majority of tasks. Also, several components or nodes are also adopted by this function as they are of vital importance. For example, fields are paramount for competition, and even though the infrastructure function should perform this, it is adopted by the competition's component. This results in higher demand for those involved with competitions. These findings suggest that there are significant emergent characteristics of the system that help to make it work that result in a very different structure to that imagined by the governing body.

Furthermore, there are significant emergent challenges that must be dealt with that result in activities occurring that are often unforeseen — particularly engagement with stakeholders and managing funds. The imbalance in workload is a significant concern in this volunteer organization. Findings suggest that the documentation associated with WAP does not match this local grassroots level. WADi does provide additional insight into the performance of activities necessary for an LFA to function effectively. WAI discussion further allows for the relative prioritization of functions and activities, thus informing the reimagining of the LFA system. This will be engaged in the recommendations section.

Resources

Within work as prescribed, resources are poorly defined. As a result, it is difficult to compare across the perspectives. It is evident from the WADi view that there is a high reliance on assets and financial resources to ensure the effective functioning of the LFA. Due to the resource scarcity of the context, additional nodes are required at the activity level, such as liaising with stakeholders in order to access required resources. The detail of the WADi resources does, however, provide an indication of what is needed for each activity within the LFA. This may again contribute to reimagining the organizational design of the LFA structure. Importantly, the

unique setting of each LFA leads to exclusive access to resources. WADI describes a resource-scarce and remote LFA. These challenges can better articulate the needs of grassroots football administrators.

Conclusion

Cognitive Work Analysis (CWA) allowed for the detailed assessment of the Makana LFA sociotechnical system. Three perspectives were presented, including work as prescribed, work as disclosed and work as imagined. Work as prescribed documentation only allowed for the completion of the work domain analysis phase of CWA. The WDA of work as prescribed denoted how SAFA prescribes the LFA to function, including its purpose and distribution of work. Work as disclosed highlighted important characteristics of how the Makana LFA currently functions. The work as imagined perspective then provided insight into how SMEs imagine the Makana LFA could function, considering both how it currently operates and how SAFA prescribes its organizational design. To conclude, the composite diagram of the WDA for work as prescribed and disclosed noted large discrepancies between SME and SAFA perspectives.

CHAPTER 4

INTEGRATED DISCUSSION

The following discussion will be broken into three components. The first section will engage with the analysis of the Makana LFA, providing the integration of the different perspectives to this sociotechnical system. The second section will discuss and review the study design adopted for the current research. Finally, part three will serve as a personal reflection on the research process.

Part 1 - Analysis of the Makana LFA

The current study identified several differences between how the Makana LFA is viewed by subject matter experts and the documentation provided by the governing body SAFA. These can be seen in the results section on page 89. Cognitive work analysis (CWA) provided a framework for the identification of these differences across multiple aspects of the Makana LFA. For instance, the work domain analysis demonstrates several discrepancies between work as disclosed and work as prescribed. The fundamental purpose of the Makana LFA, as identified by subject matter experts, differs from those outlined within SAFA prescribed documentation. Furthermore, the characteristics of the context result in disparities at the functions level, with only four of the prescribed 22 functions occurring within the Makana LFA organization. Work as prescribed also provides minimal detail on the resources required for the LFA, while work as disclosed provides significant detail for the requirements to perform related activities.

Why do mismatches matter?

Sociotechnical systems theory and systems HFE both emphasise the importance of interactions (Ottino, 2003; Carayon *et al.*, 2006; Wilson, 2014). A poor understanding of the factors that interact (and the nature of these interactions) within a system may result in reduced system functionality (Leveson, 2004; Salmon *et al.*, 2014). Furthermore, the more unplanned interactions, the greater possibility of disfunction. A relevant

theoretical consideration to the current study is the conceptualisation of the system within Rasmussen's risk management framework (Rasmussen, 1997). Interdependencies across levels of the hierarchy are critical to the successful functioning of the system as a whole. The current study demonstrates many mismatches between SAFA policymakers and Makana LFA subject matter experts (Results, pg. 89). The lack of vertical integration is frequently caused, in part, by a lack of feedback across levels of a complex socio-technical system (Cassano-Piche *et al.*, 2009). This has implications for sociotechnical system values such as responsibility to all stakeholders, as noted by Read *et al.* (2018). Interdependencies across the hierarchy of a system encourage the view of humans as assets while also promoting responsibility to all stakeholders. Therefore, it is important to unpack mismatches between stakeholder perspectives in order to inform potential system redesign.

Mismatches between SAFA and the Makana LFA

The application of cognitive work analysis (CWA) to the Makana LFA provided the framework to identify several mismatches between the perspectives of policymakers and subject matter experts. These are informed by the constraints identified within the work as disclosed perspective of CWA, constructed by subject matter experts. Due to commonalities in the nature of constraints, these disparities have been characterized according to broader mismatch categories. These categories provide insight into the nature of interactions within this socio-technical system and inform tangible potential redesign recommendations. Within each mismatch, direct quotes from participants have been included. The purpose of these quotes is to ensure that the "voices" of Makana LFA subject matter experts are heard within analysis (Hunt, 2011). Additionally, systems HFE literature promotes a systematic, holistic approach to socio-technical system analysis and design (Wilson, 2014). Consequently, recommendations based on analysis should also be systemic and holistic in its approach to system (re)design (Leveson *et al.*, 2006). Implications for

the broader socio-technical system will, therefore, be engaged in the subsequent section.

Mismatch 1: Purpose of the Makana LFA

The governing body SAFA notes within its Technical Masterplan document that the LFA is the foundation of the talent identification and development (TID) framework of South African football. This is represented within the work domain analysis of work as prescribed as functions such as technical development. However, there is minimal definitive indication within activities as to how this should be achieved. Importantly, within subject matter expert perspectives, there was minimal focus on talent identification. SMEs go as far to say “We don’t really do talent identification, as an LFA¹” and in terms of development, “Development committee? Do you actually meet? No. Competitions does that. Should be its own committee but we don’t have the means²”.

According to subject matter experts, the Makana LFA serves a more community centred purpose, as noted within the fundamental purpose of the WDA. SMEs comment on the purpose as “Giving people opportunities to better themselves – community development³” and “Promoting a healthy lifestyle and health awareness⁴”. This is in stark contrast to the talent development perspective of the governing body. SMEs do not focus on the development of high-level athletes or the importance of competition. Instead, they describe the need to contribute to their community, to play a decisive role in community development, both socially and economically. For instance, “To avoid crime and to keep the guys busy. Fighting crime and keeping them away from drugs. Giving them passion⁵.” Thus, SMEs in this context do not prioritize the purposes specified by SAFA prescribed documentation.

Implications of Mismatch 1

As SAFA defines the LFA structure as the cornerstone of the TID system within South African football, there are significant implications for the governance of local football due to this mismatch. The focus of the LFA on

participation for community health (physical activity, crime and drug abuse reduction and opportunities for growth) contrasts significantly with a more focused goal of TID. Interestingly, this community centred focus of the Makana LFA, as emphasized by subject matter experts, is consistent with South African specific football research. Researchers note the important role of grassroots football in both social upliftment (Giampiccoli & Nauright, 2019) and community health (Burnett, 2009; Fuller *et al.*, 2010; Swart *et al.*, 2011; Whitley *et al.*, 2013). This is a crucial consideration, as Höglund & Sundberg (2008) note the importance of alignment of sporting policy from a national to community level within South Africa.

HFE literature suggests that such discrepancies are likely to have a negative impact on overall system performance (Cassano-Piche *et al.*, 2009). According to Martindale *et al.* (2005) and Martindale *et al.* (2007), five key generic features emerge consistently in successful TID programs. These include long-term aims and methods, wide-ranging coherent messages and support, emphasis on appropriate development rather than early selection, individualized and ongoing development, and finally, integrated, holistic, and systematic development. Upon review, the Makana LFA struggles to abide by many of these aspects.

Subject matter experts did not comment on long term aims for the association. This was due to the lack of human resources and funding available to administrators. Also, there is no direct method to achieve any long term aims, as there is minimal directive within work as prescribed by SAFA. With regards to coherent messages and support, subject matter experts report that there is minimal communication and support within the SAFA infrastructure. For instance, SMEs note that the Sarah Baartman Regional infrastructure is poorly organized, with poor communication to its affiliates. Furthermore, identification avenues such as trials are usually coordinated by regional infrastructure. How these are organized is not explicit, and so there is a potential breakdown in the identification and the resulting development of talent. For instance, SMEs state “The region is responsible for that communication. That’s where the issues are...when and

where they are going to happen come from the region. They are disorganized, and it makes it difficult to plan and budget for it⁶”.

A substantial challenge, therefore, is the opportunities for LFA players in remote regions such as Makana where transport to other municipalities is often required. This is a concern as subject matter experts’ value vertical migration (“You want lots of people to move up that pyramid⁷”) and individual opportunity (“If you are not the strongest at academics, there is still a way for you to change...where you are...have opportunities⁸”) afforded to players within the work as disclosed perspective. Thus, there are minimal links between the lower tiers of South African football.

Finally, with regards to the development of players (appropriate holistic and ongoing development), it is purely through participation rather than skill and talent development. “Getting people to be there is the first step⁹”. Talent development in Makana has been investigated by the associated research group (See review of literature, pg. 50). A study by De Beer (2020) indicated significant skill deficits within youth players across multiple age groups. A fundamental implication of this mismatch is, therefore, the reduced development of grassroots players, a significant issue considering the proposed shift within TID literature from the focus on elite athletes to a broader objective of youth development (Rongen *et al.*, 2018).

It is apparent from these implications that the mismatch between purposes across the two perspectives result in multiple factors not being aligned between the actual functioning of the LFA and that prescribed by SAFA and are evident at various levels in the system (i.e., local, regional and national).

Mismatch 2: Human Capacity

Human capacity for the purposes of this mismatch refers to both the number of committee members and the skills and administrative qualifications of committee members. The Makana LFA adopts an organizational design that is prescribed by the governing body SAFA. However, the reality and interactions at the Makana community-level result in an inability to effectively achieve this structure. This is epitomized by comments from

SMEs such as “Our administration... it’s not good¹⁰” and “We need better systems¹¹”. Subject matter experts highlight that the Makana LFA is a volunteer organization; “What do we mean by our volunteers? We mean administrators, standing committee members and clubs¹²”. This is important as SAFA does not recognize or provide structures that are aligned with the volunteer nature of administrators within the LFA.

Furthermore, the LFA has a lack of active administrators or committee members. “We must all be in the discipline and competitions committees. We have such a small number of active people¹³”. Currently, the Makana LFA provides a platform for 25 affiliated clubs and over 1000 registered players. Furthermore, competition occurs across u13, u15, u18 and senior age groups. However, results showed that there are, in fact, only five active members of the executive of the ten that were initially elected for their term in office. According to subject matter experts, this is due to the perceived workload, lack of incentives, and lack of respect for administrators from within the community. As an example, “That’s the problem with volunteers. People just don’t want to do it¹⁴”. From the SME perspective, it is clear that providing volunteer administrative services for such a large number of players, at various age groups, across a large number of clubs is a significant challenge.

A further mismatch relating to expectations of SAFA is the capacity of Makana LFA subject matter experts. Among Makana LFA administrators, there are no football relevant educational or administrative qualifications (See Table 6). Furthermore, there is minimal experience in the administration of football or TID. “We need courses or workshops for the executive. It is very important for all to attend the workshops. As a leader, you need to know the laws of the game. You need a clear understanding of the laws, especially these days (due to internal conflict)¹⁵”. This is informed by the volunteer nature of the organization where there is a high turnover of volunteers and so minimal retention of qualifications and experience (See results, pg.89). This is not only the case at the administrative level. Studies within our research group, such as Potgieter (2016) and Callow (2018), identified significant deficits in qualifications among coaches within the

community. Furthermore, subject matter experts note that only one referee affiliated with the association has formal referee education.

Implications of Mismatch 2

The implications of the lack of volunteers are born out at the function level of the work domain analysis, where only four of the 22 prescribed functions are operational. “There are some committees that happen, some that are dysfunctional and some that don’t happen at all¹⁶”. Furthermore, according to subject matter experts, inactive elected Makana LFA officials often do not perform their designated duties. “An issue is the nonattendance of members. An issue is we have no chairperson. We currently don’t have a leader¹⁷”. This results in additional pressure on those that are active within the association. “Work in this LFA is full time, I don’t want to lie. Because you volunteer full time. This is a job; you just don’t get paid¹⁸”. The lack of available human resources significantly hampers the ability of the LFA to achieve the purposes suggested by both SAFA and the SMEs themselves.

Additionally, the level of educational background impacts the administrative operation of the LFA, coaching best practice, and referee competence. Such findings are consistent with South African football research, with Whitley *et al.* (2013) noting the importance of expanding the capacity of local coaches and Surujlal & Nguyen (2009) emphasising the need for effective human resource management within the South African grassroots sporting context. Furthermore, Kubayi (2015) reports both the importance of education and the lack of opportunities for grassroots sport coaches. A lack of opportunity and access to upskilling is a significant limiting factor. For example, Callow (2019) found that LFA coaches had not had a soccer-specific coaching course opportunity in Makhanda in the last five years and that most of them did not have the financial resources to travel to bigger centres to obtain such educational opportunities.

A notable finding of the current study, which was emphasized by subject matter experts, was the nature of prescribed documentation for the community level of football. According to SMEs, terminology, jargon, and literacy requirements within relevant literature does not suit primary first

language isiXhosa speakers with poor educational backgrounds and a shortage of resources. These characteristics place a significant burden on administrators, who must apply documentation within their own context. This is summed up by the following quote from an SME “Our club leaders are not that educated. I’m not trying to undermine anyone. These things are all written in English, and coaches can’t even interpret (the rules). That’s why people don’t want to be active in the executive. Even the explanation of the rules, they come to me personally to explain, what does it mean, can you explain the regulation in isiXhosa. We are in trouble¹⁹”. Thus, there is potential to alienate clubs due to disempowerment, resulting in combative culture, which is not constructive within the local community.

For example, “These are the knock-on effects. Misunderstanding affects the discipline committee. Clubs can’t interpret the rules. I feel sorry for clubs. They are leaderless. The blind leading the blind²⁰”. Furthermore, there is disillusionment over the prescribed documentation: “Is it a must that we need to follow the constitution at this level? We should have a policy of our own. Make it simple, and make it work for here. To apply things for our amateur football²¹”. This mismatch, therefore, results in poor execution of the organizational design of the Makana LFA, as prescribed by SAFA. Furthermore, Sharpe (2006) notes concerns that such deficits may result in the disenfranchisement of volunteers within an already prevalent global decline in volunteerism.

Mismatch 3: Funding Availability

Consistent with the context of the Makana municipality, subject matter experts specify that the economic status of the Makana LFA is dire. The LFA struggles to access adequate funding resulting in compromises to organizational design as prescribed by SAFA. For instance, “Fundraising - We do it but we don’t get it²²”. Furthermore, the Makana LFA has a lack of assets. For example, some comments from SMEs: “We don’t have our own venue or office space. As well as airtime, data or internet²³” and “We assume that all committee members have phones or computers, which is not always the case²⁴”. The Makana LFA does not own transportation,

equipment, fields, or facilities. It relies on other stakeholders for access to some resources, which are not adequate. Thus, there is a mismatch in access to resources at this level, further impacting the ability to adhere to the SAFA desired organizational design of the LFA.

An additional mismatch that exists between the work prescribed by the governing body SAFA and the Makana LFA is the lack of resource specification present at the lower levels of the work domain analysis. This results in subject matter experts slowly developing their understanding of the system rather than having definitive guidelines. This results in some queries to the nature of documentation: “If you look at these rules, they are made for professional clubs. For people who are employed. The constitution does not assist us. It binds us²⁵”. Subject matter experts, therefore, report that the prioritization of investment and relative budgeting is a challenge within the Makana LFA context.

Implications of Mismatch 3

As a result of a lack of funding, SMEs specify that the Makana LFA struggles to provide incentives to its affiliates, as well as provide capacity building opportunities to its community members. Thus, there is an impact on the desired fundamental purpose and values of the system as reported in work as disclosed. “We are limited in what we can use and what we have. We rely on others²⁶”. An example is how the Makana LFA cannot afford auditing of its finances, which is a requirement by SAFA. “The thing about no auditors is that its noncompliance to SAFA regulations. And that’s a challenge. But it’s because of finance and sponsorship. We can’t afford it. And funders require this information²⁷”

Providing remuneration is also a significant challenge. For example, “We value time because the issue..., with those of us who are there (at the field), we value time and money. These people need to be paid. So, we value money based on the work they have done. -----They should receive incentives, rewarding involvement²⁸”. This is due in part to the challenges of the context previously described. However, due to the financial constraints on the system, currently, only referees are given any

reimbursement for their time, with these payments coming from the clubs at R30 (\$1.73) per game. Furthermore, the budget for the entire LFA is only R12000 per year, with R6000 (\$347) distributed in prize money. Consequently, the Makana LFA does not have the necessary equipment or assets to administer local football effectively.

The lack of resources is not uncommon within the South African sporting context. Pelak (2005), Höglund & Sundberg (2008) and Surujlal & Nguyen (2009) indicate that a lack of resources is a significant barrier at the community sport level, while Kubayi *et al.* (2017) note significant resource differences across the South African context. This financial constraint has significant implications within the Makana LFA as it reduces the flexibility and ability to adapt to suit local conditions. Subsequently, there is reduced resilience within this socio-technical system (Hollnagel *et al.* 2006). This is a significant stumbling block for the efficiency of the LFA system within the SAFA network. SAFA does not adequately state the resources needed for administration at the level, and most importantly, does not make provisions to support administrators in gaining access to the resources they need. This is a significant organisational malpractice and results in poor organisational efficiency. A key strategic goal therefore of SAFA going forward should be the reconceptualising and better alignment of the LFA system with the realities of the clubs participating at this level. This project clearly highlights some of the key barriers to the realisation of the current objectives but also provides important affordances to reimagine the LFA structures as a vital component of community sports programs. Potential funding for such programs may therefore be potentially sourced through different avenues.

Mismatch 4: Infrastructure and Stakeholder Networking

The Makana LFA serves as a subordinate to the SAFA Sarah Baartman Regional office and is highly dependent on management at the regional level. However, as previously described, the region is poorly organized with minimal communication. Thus, Makana subject matter experts report establishing their own policies to solve emergent issues.

Furthermore, as the Makana LFA has few of its own assets, there is a reliance on local stakeholder support to perform its administration. For example, DSRAC is a branch of local governance that manages local sporting programs. The LFA does not have its own printer or resources for ink and paper: “We don’t have our own resources, so we have to go and print at DSRAC²⁹”. The Makana LFA also relies on stakeholders for equipment such as balls and football kit and also maintenance resources to manage the fields. An additional concern is that the Makana municipality owns the field where Makana LFA fixtures take place. Due to financial constraints and mismanagement, the fields are in poor condition and are not within the scope of the Makana LFA to improve. The relationship is problematic: “There is no municipal cooperation³⁰”.

According to subject matter experts, administrators spend significant time engaging with these departments to harness additional resources to bridge the deficit in resource availability. However, these relationships are not formalized, and according to subject matter experts, this creates challenges. For instance, “The association writes to them, but they don’t deliver. That is why we are being more forceful. Because we are vulnerable. We have no evidence of our conversations and meetings. That’s why we ask for documents that say you will give us these items. They say there isn’t any document, but we say we need one³¹”. There are also issues with authority and jurisdiction as the interaction with stakeholders is not established. “Who is supposed to give us an office? DSRAC or municipality? Who is our umbrella? DSRAC. There is supposed to be a sports council I think, which doesn’t exist. DSRAC will be quiet³²”. It is evident that there is a lack of infrastructure and recognized stakeholder networks to support the Makana LFA.

Implications of Mismatch 4

The lack of support and coordination from additional stakeholders such as the SAFA region, municipal infrastructure and DSRAC places significant strain on the Makana LFA and its operational direction. Subject matter experts emphasize contextual challenges that play a significant role at the

grassroots level throughout their discussions. These observations are consistent with Höglund & Sundberg (2008), emphasizing the important influence of contextual factors in South African community sport. For instance, poverty and socioeconomic status of community football members impact their access to adequate housing and healthcare. This further results in insufficient resources, particularly football-related equipment and upskilling opportunities.

Additionally, poor municipal service delivery influences the standard of facilities that exist within the community and also contributes to the lack of access to education opportunities (See contextualization on pg.26). These characteristics and challenges may be different to those experienced by LFAs in larger metropolitan areas, as remoteness is well established in the literature as a barrier to participation in physical activity (Bauman *et al.*, 2012; Brown *et al.*, 2014). These findings emphasise the need for governing bodies in sports such as football to be acutely aware of context and how this influences the constraints placed on the ability of the system to comply with the “imagined” work prescriptions. Furthermore, South African football researchers emphasise the importance of stakeholder collaboration to optimise community sport (Burnett, 2009; Whitley *et al.*, 2013). The role of stakeholder relations will be explored in the next section.

Table 25: Summary of mismatches between Work as prescribed and work as disclosed.

<u>Mismatch</u>	<u>SAFA Perspective</u>	<u>SME Perspective</u>	<u>Implication</u>
1) Purpose of the Makana LFA	Foundation of TID in South Africa	Community Centred Organization	Minimal TID
2) Human Capacity	Sufficient numbers and capacity to achieve WAP organizational design	Low numbers and low capacity	Noncompliance to Work as prescribed
3) Funding Availability	LFAs are sufficiently resourced	Minimal funding and assets	Inefficient administration, a lack of investment and incentives

4) Infrastructure and Stakeholder Networking	Other stakeholders fulfil obligations	Additional stakeholders are poorly organized	Misallocation of resources in a resource-scarce context
--	---------------------------------------	--	---

The current study identified four key mismatches between how SAFA policymakers envision work and how subject matter experts disclose it (Summary in Table 25). It is clear that there is significant dysfunction within the Makana LFA. Importantly, these mismatches are presented in isolation. This suggests linearity with the system. However, the systems approach emphasises the concept that optimization is an emergent property resulting from non-linear interactions between multiple components across complex sociotechnical systems (Carayon, 2006; Cassano-Piche *et al.*, 2009; Salmon *et al.*, 2014; Wilson, 2014).

HFE further emphasises the interaction between different elements of a system, and as such, it is important to acknowledge the intersection of the various mismatches that have already been presented. For example, the lack of human resources, infrastructure and stakeholder networking play a distinct role in talent identification and development (Toohey *et al.*, 2018). The Makana LFA, therefore, has complex unplanned interactions, influencing the functionality of the system. Engaging with complexity and emergence may provide a more effective platform for sustainable system redesign. The following section will, therefore, take a broader systems perspective to the Makana LFA to understand the complexities within this setting and the challenges for administrators and the governing body SAFA.

Systems Lens: The Messy Reality

Cognitive work analysis (CWA) provided an effective platform to identify constraints within the context of the Makana LFA, particularly through the strategies analysis phase. To represent the complexities of the Makana LFA, these constraints are shown in Figure 11 within the general system model framework (Carayon *et al.*, 2006). Importantly, the Makana LFA is a child system of the larger SAFA national infrastructure. Consequently, the

procedures are prescribed by policymakers. Stakeholders relevant to the Makana LFA have been shown within Rasmussen's risk management framework (Rasmussen, 1997) to acknowledge the role of stakeholders at various levels within the system. The focus of the interactions shown is between the child (Makana LFA) and the other stakeholders, as this was the focal system of interest in the current study. It is acknowledged that other interactions are vital for understanding broader systemic factors.

Figure 11 shows a complex, nonlinear sociotechnical system. Furthermore, mismatches and identified constraints display that there are multiple, potentially problematic interactions across the various elements of the works systems model. From the person (e.g., lack of capacity), to the task (e.g., Field maintenance), to the tools (e.g., No office), to the organization (e.g., Committee workload), and to the environment (e.g., socioeconomic context of Makana). An additional consideration is the broader characteristics of the system of football in South Africa identified through previous research. These aspects are noted in the general systems model in the review of literature (pg. 41), including disciplines such as sport science, management, political science, social development, psychology and sociology. Related South African football research further emphasizes the complex nature of football within South Africa.

Additionally, there are significant perceived failures in procedures as SMEs were critical of complex documentation ("We need what works for our level. Not everything in the SAFA document is relevant³³"). The lack of vertical integration is frequently caused, in part, by a lack of feedback across levels of a complex socio-technical system (Cassano-Piche *et al.*, 2009) evident within this sociotechnical system. Thus, the red arrows in Figure 11 represent one-directional communication, both from SAFA national and from South African government and their relationship to local structures of DSRAC and the Makana municipality. The gold arrows represent how stakeholders should theoretically interact.

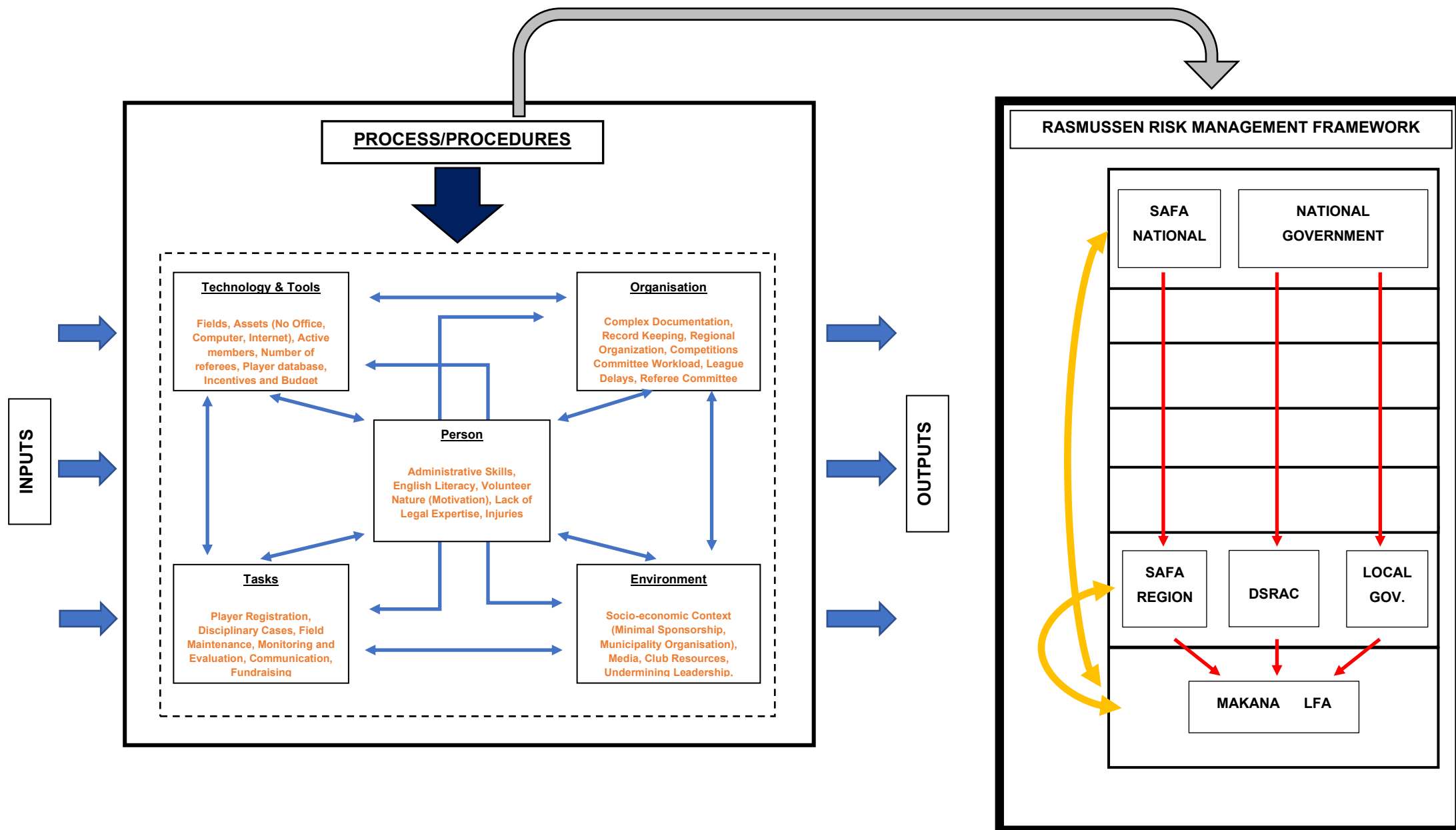


Figure 11: Model to show the socio-technical system of the Makana LFA. Procedures are influenced by stakeholders, and are represented in the accompanying Risk Management Framework (Rasmussen, 1997)

The International Ergonomics Association (IEA) argues that HFE is the science that investigates interactions between humans and other elements of the system. Interactions are influenced/impacted by a variety of factors such as those illustrated in Figure 11 above and are, therefore, vital for system performance. What is important is understanding why there is a disparity between the perspective of the Makana LFA and the governing body SAFA, which result in unplanned interactions. Two key overarching system constraints were identified through the application of CWA to the Makana LFA: 1) Feedback loops and 2) Contextual factors. The following section will, therefore, discuss these constraints.

A lack of Feedback Loops

The Makana LFA serves as the grassroots foundation of the SAFA organization. Within the risk management framework (Rasmussen, 1997), SAFA, therefore, acts as the policymaker or regulator of LFA football in South Africa, with the LFA performing the work at the sharp end of the organization. According to Salmon *et al.* (2014), information at the lower levels regarding the system's status needs to transfer up the hierarchy to inform the decisions and actions occurring at the higher levels (Cassano-Piche *et al.*, 2009). Without this so-called "vertical integration", systems can lose control of the processes that they are designed to control (Cassano-Piche *et al.*, 2009).

Mismatches identified within the present study indicate that SAFA policymakers may not acknowledge the contextual challenges of those at the sharp end. The SMEs specified that there were no clear communication channels to feedback experiences, challenges, etc., to the regional or national level bodies of SAFA. A significant issue is, therefore, disclosure and the lack of feedback loops as policymakers get minimal feedback regarding the challenges of administrators at this level (Miles & Randle, 2016).

The concern, as raised by Catchpole & Jeffcott (2016) and Waterson *et al.*, (2017), is that when there is minimal feedback, there is increased distance between the perspectives. Work-as-prescribed may become increasingly

detached from reality, potentially invalidating many organisational and regulatory control measures, which are tied to work-as-prescribed. The mismatches identified, which are present across all levels of the work domain analysis composite diagram (pg. 134), demonstrate potential breakdown in system functionality, with discrepancies between how policymakers envision the system and how it occurs according to subject matter experts.

Furthermore, subject matter experts report that the job requirements associated with the Makana LFA are significantly different from how work is prescribed. “But when it comes to the work we wanted to comply. Our compliance resulted in issues. It does not work³⁴”. As a result, SMEs express concern over work as prescribed: “SAFA documentation is very complex. It comes back to that complexity. The level of understanding of our local clubs is not high³⁵”. This can be harmful to system functionality and lead to questionable decisions, as evidenced by subject matter experts when discussing the various activities required within the Makana LFA.

For instance, “Even if clubs are late (with affiliation), we take them. The same clubs swear at us, the same ones we helped³⁶”. Another example is quorum at committee meetings: “Member attendance at meetings. Is there a rule? It needs to be over 50% (to reach quorum). So, there is a rule, but it isn’t enforced. There are committee members that have missed multiple meetings. But they are still part of the committee on paper. We have unenforced rules³⁷”. Additionally, this has a direct influence on the retention of administrators as disillusionment with the governing body is a concern: “How does it make us feel? It's disrespectful and undermining to us as the LFA. If you want people to volunteer, you should give them the resources they need. It disrespects the local community³⁸”.

When things go wrong, outcomes of the system are often attributed to the decisions that administrators make, especially when these are different from work-as-prescribed. Importantly, as noted by Shorrocks *et al.* (2016), such attributions take insufficient account of context and instead take the form of simplistic labels (“violation”, “non-compliance”, “rule-breaking”, etc.). Subject matter experts report this: “That does affect how good we are

at monitoring and evaluation. It links to the fact we don't have enough people, and we are doing multiple jobs. And it links back to not getting paid. You don't do things properly when you don't get paid. And you cannot force or put pressure on volunteers to do it³⁹". Within the Makana LFA, there are several implications. The structure of leagues and the duration of the season are typically compromised due to delays at the beginning of the year. Deadlines are often shifted in spite of numerous attempts to get the leagues started. Registration is a significant challenge where there is no database of registered players and their affiliated club. An important consideration is that this dynamic exists even in the absence of a detailed prescription of work (Pariès & Hayward, 2016; Allspaw, 2016). Administrators are expected to solve emergent issues within the system with minimal guidance. It is evident that mismatches identified from the current analysis specify that there is a lack of feedback loops from administrators regarding the contextual challenges at the grassroots level.

The importance of Context

As previously described with the review of literature, the context of Makana poses a number of relevant challenges (pg. 26). The Eastern Cape is epitomized by an inadequate provision of education, a lack of necessary facilities like toilets, electricity or water, and poor transport infrastructure (Lemon, 2004). Furthermore, communicable diseases such as HIV and tuberculosis are rife within the local communities (Mayosi *et al.*, 2009). Within Makana specifically, subject matter experts further indicate high levels of unemployment and low socioeconomic status. This is also described in the review of literature (pg. 43). These factors and contextual constraints play a significant role in the emergent structure of the Makana LFA, resulting in unique interactions within the LFA sociotechnical system. According to subject matter experts, these factors play a role in the retention of administrative volunteers, as well as the educational level of stakeholders such as coaches and referees within Makana.

An important consideration is also the interaction of the Makana LFA with additional stakeholders (See pg. 154). The functionality of this system is dependent on stakeholders. For instance, fixtures are influenced by the

Sarah Baartman regional office schedule. Makana LFA affiliates who play in the regional league require the use of the fields when they have home games. Subject matter experts report that fixtures are often released late, resulting in the LFA having to adjust their schedule. “There is communication over telephone. But there is nothing binding them⁴⁰”. These fields are owned by the Makana municipality which has issues with poor service delivery. As a result, the fields are in a poor state, uneven, not marked, with poor drainage.



Figure 12: State of JD Dlepu Stadium

Furthermore, there is conflict with the municipality over safety at the stadium. “There is supposed to be security, but it’s a challenge on its own. There are a lot of challenges. Remember the poles were destroyed many times last season. Security is a challenge. The municipality is a challenge⁴¹”. There is also a lack of practice space for affiliates, with only 3 of 25 clubs practising on marked, level, well-maintained fields. As a result, additional stakeholders are sought for the use of their facilities, such as 6 SAI army and Rhodes university. Subject matter experts also report that resources such as poles and referees are also often borrowed from these stakeholders.

DSRAC is also a vital stakeholder to reduce the resource deficit for the Makana LFA. There is a reliance on upskilling opportunities and resources through government funding for grassroots sporting programmes. However, DSRAC serves all sporting codes and disciplines within the region, and thus, its influence is highly stretched. To note, “We struggle with liaising with stakeholders. We do not overcome the constraints. We do not have

very good relations with stakeholders. They have issues with pride and ego⁴²". Importantly, the youth system of the Makana LFA is reliant on school football and is poorly coordinated. There is minimal sporting infrastructure at a school level in Makana, and so the Makana LFA fulfils this role. Finally, a vital stakeholder is the clubs themselves. Clubs are faced with the same challenges as the Makana LFA and so struggle to offer sufficient talent identification and development opportunities. HFE researchers such as Kirwan (2000), Theberge & Neumann (2010) and Stanton & Harvey (2017) discuss how crucial context is to the understanding and performance of work at the sharp end. Thus, these contextual factors, as highlighted above, are highly influential on the Makana LFA system and impact the interactions within the system and, consequently, overall system performance.

Interactions and Archetypes

To engage with these interactions, it is important to conceptualize the nature of work-related archetypes. Stanton (2014) comments that the benefits of classification of systems or networks into archetypes allows for system interactions to be understood in their entirety (Plant & Stanton, 2013). Comparison of the perspectives and the resulting identification of mismatches within the current study is typical of the "Messy reality" archetype of work as described within a blog post by Steven Shorrock in 2016. The "Messy Reality" is characterised by adaptations, trade-offs, compromises, and workarounds that are hard to prescribe and hard to see from afar (Shorrock & Williams, 2016). Thus, work as prescribed is a challenge for SAFA due to the strong influence of contextual factors.

Subject matter experts are faced with unique challenges that are not reflected within work as prescribed, as they are difficult for system designers to anticipate. Compromises are often made, for instance, on registration requirements and deadlines within the Makana LFA. If deadlines were rigid, there would be no functional leagues as teams struggle with financial resources and technological access. "Even if (clubs) are late, we take them. The same clubs swear at us, the same ones we helped³⁶". Additionally, protests and appeal costs for misconduct issues are often

voided due to the financial constraints previously mentioned. Furthermore, work as prescribed by SAFA is highly generic with minimal detail, exhibited by the sparse population of the activities and resource levels of the work domain analysis. An emergent characteristic of systems that have poorly designed components which negatively impact reliable human performance, as described by Wilson (2014), is workers changing the functioning of the system themselves. The Chartered Institute of Ergonomics and Human Factors (CIEHF) white paper (2020) refers to these emergent behaviours as local adaptations and should be taken into consideration in future design. This was evident in the current study, where subject matter experts resolve issues themselves. This results in the inertia of the Makana LFA, as it struggles to shift out of short-term orientated functioning. There are minimal long-term aims and growth, with minimal comment by subject matter experts.

Interestingly, at the functional level of the work domain analysis, only four functions are operational. The remaining standing committees are not formed. The consequences are that gaps between work-as-prescribed and work as disclosed are increased. This may be the basis for disciplinary and regulatory/legal action against individuals and organisations. An obvious problem with this is that the defunct work (Shorrocks & Williams, 2016) might represent good practice with benefits for safety, health, or other goals. Subject matter experts indicated that from their perspective, the operational design shown by SAFA is the desired system state. "We think that SAFA regulations are important. Someone should be in charge of making sure we comply. That is why we have a discipline committee⁴³". However, the reality of constraints at this level means that it is not possible to achieve this system design. "SAFA should provide documentation for each level of football. Instead of one size fits all⁴⁴".

As noted by Rasmussen (1997), each level of the hierarchy of stakeholders has their own constraints and influences. Furthermore, they have their own perspective on the socio-technical system (Hollnagel, 2016). It is evident that there is poor alignment between the perspectives of the child system (Makana LFA) and the parent system (SAFA) (Thatcher & Yeow, 2016). The

consequence of a mismatch in perspectives between workers at the sharp and blunt end is poor socio-technical system functioning (Salmon *et al.*, 2014). Furthermore, stakeholders cannot address these challenges as they may not have knowledge of the contextual factors faced by those at different levels within the system (Cassano-Piche *et al.*, 2009). Thus, better alignment between workers at the sharp end (Micro-level) and policymakers (macro-level), through adequate reporting, may improve adaptability and increase resilience within the Makana LFA system (Rasmussen, 1997; Hollnagel *et al.*, 2015; Shorrock, 2019).

Systems Lens: Learning from Local Adaptation

It is easy to view the above mismatches and poorly designed interactions as indicative of a highly dysfunctional sociotechnical system, incapable of performing its duties within the talent identification and development framework. However, the Makana LFA serves over 1000 registered players, with 25 involved clubs and multiple divisions. Despite a number of contextual challenges, administrators perform admirable work in 1) providing a physical activity platform, 2) Keeping the youth off the streets (and the related crime and drug issues) and 3) Facilitating learning opportunities for community members. It could perhaps be argued that the human factor (i.e., the people in the system) ensures the functioning of the system in spite of the constraints placed on the system. In fact, the local context has revealed significant affordances for the functioning of LFAs well beyond the scope of simply being a TID system. With these affordances come other opportunities for the exploration of expanding the involvement of other stakeholders (a key affordance highlighted by the study and picked up later in the discussion).

As noted by Wilson (2014), emergent properties can be defined as the impact of poor designs being mitigated through the well-recognised resilience and adaptability of users to find a way to make the system work despite its shortcomings. Thus, subject matter experts have reimagined the Makana LFA, under significant constraints, to serve a community centred purpose. Furthermore, in the recently released white paper on learning from

adverse events by the Chartered Institute for Ergonomics and Human Factors (2020), there is an emphasis placed on understanding local adaptations to system functioning/activities as being an indication of shortcomings in the design of the system. It is evident from the current study that the one size fits all approach and lack of contextual factors being incorporated into the design of lower levels of the system have a negative impact on overall performance. Thus, there is an affordance for the governing body SAFA, as subject matter experts have identified a new role of the Makana LFA within their local community.

Furthermore, as Makana is a resource-constrained system, balance theory is a vital consideration within this context (Carayon, 2009). The current study does not argue that it is reasonable to get rid of all negative components but rather balance the overall critical elements to optimize performance, reduce job stress and encourage well-being. The application of adapted CWA allowed for characteristics of the system to be brought to light. Key outcomes, therefore, include affordances for what can potentially be done. Consequently, each mismatch will be discussed to inform potential redesign.

Mismatch 1: Reimagining Purpose and Closing the Gap

Subject matter experts described different fundamental purposes of the system to those prescribed by SAFA. In South Africa, it is well known that there is a need for improved social cohesion, socio-economic advantage, and constructive outlets to occupy the population (David *et al.*, 2018). Subject matter experts note that the Makana LFA is directed towards community benefits such as community development, the platform for passion, and combating crime. This is not reflected within the work as prescribed perspectives where football is the primary focus, with its development administration and growth fundamental to the role of the LFA. The identification of the purpose of the Makana LFA according to subject matter experts, therefore, is an important outcome of this study. This is an opportunity or affordance recognised through the cognitive work analysis platform. Within TID related research, there has been a call for fundamental

change in the conception of TID (Toohey *et al.*, 2018). Rongen *et al.* (2018) contended that due to significant financial investment in such programs, they are under pressure to translate investment into elite athletes. As a result, there is an unbalanced focus on high-level performance rather than holistic development (Abbott *et al.*, 2005). Consequently, researchers have started to question both the effectiveness of talent identification programs and the wellbeing of participating athletes in terms of both psychological impact and injury risk (Rongen *et al.*, 2018). These authors advocate for a shift away from the focus on elite athletes to a broader objective of supporting participation in sport.

In essence, it is proposed that the LFA can fulfil both roles. Serve the community centred needs as outlined above, and contribute more effectively to the TID network of South African football. The key findings in this regard of the current study can, therefore, be reported as 1) SAFA documentation could be better aligned with best practice for TID and 2) LFA subject matter experts desire to fulfil both community centred and TID roles, but the system does not adequately prepare or provide for administrators. Therefore, it may be prudent to reconceptualize the LFA infrastructure to embrace these roles. What follows is, therefore, a justification of the view of the LFA as a community sports organization, and how this perspective can contribute to both community development and the priorities of sporting participation. This may then provide the platform for TID, an important focus of the governing body SAFA.

Embracing Ubuntu: Makana LFA as a Community Sport Organization (CSO)

Subject matter experts highlight the critical role the LFA plays within the local Makana community. This is due to the popularity of football and the contribution of the grassroots football organizational structure to community upliftment. SMEs at the sharp end view their system as a community centred organization. A key point within work as prescribed by subject matter experts was the African value of Ubuntu. According to Nussbaum (2003) Ubuntu is “the capacity in African culture to express compassion, reciprocity, dignity, harmony and humanity in the interests of building and

maintaining community with justice and mutual caring” (pg. 2). This context-specific concept is deeply rooted in African philosophy (Venter, 2004) and highlights the community-driven nature of African culture. Importantly, as noted by Lutz (2009), the individual does not pursue the common good at the expense of their own good but rather through collective solidarity. Subject matter experts emphasize a desire for Afrocentric ideologies such as Ubuntu, which are not prescribed within SAFA documentation. This is a significant affordance and frames the proposed nature of the Makana LFA: A community sport organisation.

A fundamental role of CSOs is the promotion of participation in physical activity (Rosso & McGrath, 2017; Jones, Edwards, Bocarro, Bunds, & Smith, 2018). Involvement in physical activity can result in many advantages, including physical, psycho-social, and educational benefits (Eime *et al.*, 2013; Herrington & Brussoni, 2015). Other positive effects include improved life skills and peer relationships while also resulting in higher academic achievements and pass rates (Donnelly *et al.*, 2016; Donnelly *et al.* 2017). This is particularly important within the socioeconomic context of South Africa, where health and educational deficits play a significant role in propagating inequality (May & Govender, 1998; More & Aye, 2017).

The benefits identified here correspond to the fundamental purposes and values defined by subject matter experts within the Makana LFA system. It is sensible that the LFA be viewed as a community sport organization, as several similarities exist within the literature to those identified by subject matter experts within the current investigation. For instance, CSOs tend to operate with inadequate resources, lack required staff competencies, and struggle to deliver their missions (Light, 2004; Wicker & Breuer, 2011; Misener & Doherty, 2013). Reimagining the LFA as a CSO would allow better alignment between SAFA and LFAs and provide improved strategies for its optimisation.

As the basis of “grassroots” sport participation in many countries, community sport programs are expected to provide individual and social benefits, such as youth development and community cohesion (Donnelly & Kidd, 2003). The Makana LFA, therefore, fits this description, with subject

matter experts serving as volunteers, aiming to promote physical activity, upliftment opportunities, and social cohesion. Considering the LFA as a CSO, it is logical to investigate CSO related literature. Identification of common characteristics, and most importantly, the challenges, will provide a platform for reimagining the purpose of the Makana LFA.

Characteristics and Challenges associated with CSOs

Clutterbuck & Doherty (2019) investigated the organizational capacity of sport for development structures. The authors examined common themes across multiple CSOs and identified the characteristics or fundamental concepts necessary for their success and optimization. Utilizing Hall *et al.* (2003), a framework for comparison is demonstrated in Table 26 below. A practical approach is, therefore, to assess the compatibility of the Makana LFA to these capacity dimensions.

Table 26: Capacity dimensions and critical elements of community sport organizations (adapted from Clutterbuck & Doherty (2019))

<u>Capacity Dimension</u>	<u>Critical Elements</u>
Human Resources	Passion, Familiarity with Developmental Issues, Values and competencies, Active and engaged volunteers, sufficient staff, Administrative help for volunteers, training and support, shared vision.
Finances	Fundraising success, grant funding success, fiscal responsibility, sustainable funding.
Relationships and Networks	Engaged partners, sustained partnerships, social capital, time to manage partnerships
Infrastructure	Information technology, effective communication, facilities, formalization.
Planning and development	Strategic planning, collaborative planning, awareness of risks and opportunities.

When compared to this framework established by Hall *et al.* (2003), it is evident that Makana LFA subject matter experts have raised both constraints and affordances within the context that are applicable to the categorisation of the Makana LFA as a community sport organization (see results composite diagram, pg. 132). This conceptualization may influence how policymakers envision the functioning of the system. This, in turn, reduces the distance between perspectives, highlighted as necessary by (Hollnagel, 2016; Shorrock & Williams, 2016). The redefining of the LFA as a CSO also promotes the health and wellness of community members, aligning to the sociotechnical value of the promotion of quality of life.

A vital consideration is for the acknowledgement of the work done by football administrators and coaches at this community level who regularly overcome challenges. Their importance is often underappreciated, and empowerment to these dedicated public servants is a necessity to encourage retention. This is an important theoretical consideration. As described by Hollnagel *et al.* (2015) and Hollnagel (2016), value should be placed on the perspective of front-line workers. The current study recommends participatory HFE approaches to system redesign at the LFA level to take advantage of the passions and knowledge of the system and context at that level. The benefits of this overall approach are also linked to sociotechnical systems theory values (Read *et al.*, 2018) where value is placed on the opinions of subject matter experts, encouraging respect for individual differences and responsibility to all stakeholders.

Mismatch 2: Rising to the Capacity Challenge

According to Nusem, Wrigley, & Matthews (2017), non-profit organizations feature unique workforce structures and cultural archetypes that are critical to consider when fostering organizational capability. Interestingly, it is not uncommon for change initiatives to fail in achieving the traction required for sustainability. A significant concern within CSOs is high staff turnover, resulting in difficulties in building organizational capability and maintaining knowledge (Nusem *et al.*, 2017). This is highly relevant to the Makana LFA system, as there is significant changeover in committee members resulting

in challenges to effective governance. Both Svensson & Levine (2017) and Nusem *et al.* (2017) suggest that for an organization to foster design capability, change needs to be driven in small stages and be commissioned by a higher external authority (e.g., government or a board of directors). This highlights the importance of the perspective of the governing body SAFA and their prescribed documentation.

An interesting question is the optimization of the LFA framework as a football talent and development structure. As noted by Martindale, Collins, & Daubney (2005) and Martindale *et al.* (2007), successful TID organizations emphasize appropriate development rather than early selection, individualized and ongoing development, and finally, integrated, holistic, and systematic development. Thus, there is a high reliance on effective coaching and administration within the grassroots context. This is emphasized by subject matter experts within the current context, who value the development of their community through upskilling and socioeconomic advancement. For example, “How do we know if we are developing the community? Increased level of skills. Capacity building and the transfer of skills⁴⁵”. Furthermore, considering the resource-scarce nature of the Makana context and the realities of South African communities, growth and development of community capacity is of the utmost importance.

Upskilling of stakeholders within the Makana context will promote a more effective physical activity platform. This may result in the growth of competitiveness and effective athlete development within the vertical migration system (Toohey *et al.*, 2018). The priority of human capacity building also contributes to resolving the second mismatch identified within the current research. It is, therefore, necessary to engage with community capacity and its development.

Cultivating Community Capacity

Within the context of community sport organizations, Jones *et al.* (2018) defines community capacity as local stakeholders’ skills, knowledge, and resources that may be leveraged for change. Makana LFA analysis

indicated a lack of community capacity, which is a paramount limitation within the LFA, and an essential finding of the current study. As workers perform tasks with varying degrees of freedom, ensuring they have the necessary skills to deal with emergent issues is crucial (Hollnagel *et al.*, 2015). Increased capacity allows workers to adopt different paths of behaviour increasing resilience and adaptability within the system (Hollnagel *et al.* 2006).

The impact of community empowerment is significant, as communities possessing capacity are more likely to mobilize resources, leverage social connections, and build supportive institutional structures by their own choice (Wendel *et al.*, 2009). Additionally, this approach is consistent with the Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou (2004) approach to social innovation, helping it happen through participatory approaches.

Conversely, communities lacking capacity often struggle to achieve these objectives due to a lack of human capital, inadequate infrastructure, limited political influence, and fragmented social ties (Wendel *et al.*, 2009). By developing and utilizing community-led management practices to deliver sport programs, CSOs can improve local skills and knowledge (e.g., leadership), establish connections with other community institutions, and provide structures for community dialogue (Edwards, 2015). This is highly prevalent within the Makana LFA due to the constraints previously identified.

Thus, a prudent approach is to provide upliftment and capacity building opportunities for Makana LFA affiliates and community football members. Edwards (2015) classifies the dimensions of community capacity in more detail and is demonstrated in Table 27 below. These are important to engage in establishing an appropriate strategy for future research.

Table 27: Dimensions of community capacity (Edwards, 2015)

<u>Dimension</u>	<u>Definition</u>
Level of skills and resources	Development of and access to resources and skills within the community.
Nature of social relations	Sense of community: Social capital.
Structures, mechanisms, and space for community dialogue	Social and interorganizational networks; Mechanisms for communication and citizen input.
Leadership	Effective and sustainable leadership and leadership development.
Civic Partnership	Distribution of community power and ability for citizens to participate in community processes.
Value system	Shared community values that support democracy, inclusion and social justice.
Learning culture	Understanding and awareness of community history and ability to critically reflect on shared experiences.

Importantly, the table above demonstrates the interdependencies reflected within the identified constraints and mismatches of the current study. These constraints are typical of remote, under-resourced and poorly managed municipalities such as Makana (Hart, 2002; Coovadia, Jewkes, Barron, Sanders, & McIntyre, 2009; Leclerc-Madlala, Simbayi, & Cloete, 2009; Nair & Campbell, 2008). In terms of strategy to rectify such deficits, Jones *et al.* (2018) describe the following: “A greater understanding of how CSOs build organizational capacity is essential to maximizing their potential in promoting community capacity. Unstable funding, limited human resources, and a lack of strategic capacities significantly impact (organizations) ability to contribute to various dimensions of community capacity and presented a strategic dilemma related to the process of building organizational capacity.” A vital future research direction is, therefore, an investigation into

how CSOs can harness resources and establish sustainable capacity development programs.

Mismatch 3 and 4: Funding and Stakeholder Networking

The Makana LFA is a resource-scarce context. Formalized sustainable funding support for LFAs may improve the provision of socioeconomic upliftment to community members. Furthermore, consistent with Rasmussen's framework (1997), there is a need for formalized inter-organizational networks. This may reduce the need for significant financial investment through the optimization of resource allocation within communities such as Makana. Subject matter experts indicated that several stakeholders are vital for the functioning of the Makana LFA. This includes the immediate hierarchical structure of the Sarah Baartman region within the SAFA infrastructure.

Establishing definitive roles as well as reporting and feedback mechanisms is essential to link the tiers of South African football administration. Formalized relations are also necessary with additional stakeholders, as the local municipality are responsible for local facilities while DSRAC plays a role in upskilling and capacity building through educational courses and related activities. This is a possible way forward to engage with building local capacity and leadership capability. In turn, this may inform civic partnership, value systems and learning culture that may prove instrumental to the redesign of the LFA system.

Informing Redesign – Recommendations from CWA

Recommendations to policymakers may influence general mismatches between work as disclosed and work as prescribed. Importantly, cognitive work analysis provided the platform for the identification of constraints and affordances within the Makana LFA context. Subject matter experts identified constraints through the work as disclosed perspective and the work as imagined perspective, which allowed engagement with affordances and opportunities within the Makana LFA system. These are important outcomes of the current research and provide more immediate system

redesign recommendations for the Makana LFA. These guidelines are also useful for the governing body SAFA in improving the optimisation of LFA infrastructure.

Prescribed documentation: Incorporating Constraints and affordances

A significant constraint identified within the context is the complex nature of SAFA prescribed documentation. SAFA Statutes, explicit for the LFA, contain complicated jargon and terminology. Furthermore, in the view of subject matter experts, they do not provide sufficient guidance to the execution of both associated tasks and scope for dealing with the complexities inherent to the Makana context. “If you look at these rules, they are made for professional clubs. For people who are employed. The constitution does not assist us. It binds us. Is it a must that we need to follow the constitution at this level? We should have a policy of our own. Make it simple, and make it work for here. To apply to amateur football⁴⁶”.

Due to factors such as poor English literacy, poor socioeconomic background, and a lack of education, there are challenges with both the execution of the accompanying documentation as well as compliance with the structure and rules described. Such documentation should consider the challenges of remote LFAs in poor provinces such as the Eastern Cape, where access to basic needs is a challenge. It is therefore recommended that SAFA engage with the unique challenges within these areas to redesign documentation that is more appropriate to the English literacy level of the national qualifications framework (NQF) level 4. This is appropriate for community members with high school education. A prudent way to approach the constraints and affordances identified through the cognitive work analysis framework is to incorporate within prescribed documentation.

Table 28: Constraints and related strategies as identified and discussed by subject matter experts during cognitive work analysis process

<u>Constraint</u>	<u>Description</u>	<u>Strategy</u>
<i>Complex Documentation</i>	LFA Documentation does not consider the educational and socioeconomic level of community members. As a result, there is reduced understanding by both administrators and clubs, resulting in misconduct and conflict.	Simplified documentation should be created, more appropriate for an LFA level. This should remove highly convoluted language and organizational structures not applicable for this level of football administration.
<i>Few Active Committee Members</i>	The LFA has a lack of active administrators. This is due to the perceived workload, lack of incentives, and lack of respect for administrators from within the community.	Aspects such as incentives have been discussed, e.g., monetary or skills-based. This is influenced by funding availability and stakeholder interaction. It is crucial to recruit administrators at a young age so they can be upskilled and transitioned into capable administrators. There are significant challenges in recruitment. There is a need to improve the respect given to committee members. Thus, open discussions with clubs and community members, promoting honest dialogue would be beneficial. Committee members should be given some status symbols, such as a uniform. An additional recommendation is that affiliated clubs should be required to have one member serving on a standing committee within the LFA. Following constitutional agreement, this would lead to a greater capacity for administration.
<i>Limited Qualifications/Experience</i>	Within the Makana LFA football community, there is a distinct lack of football-related qualifications. The lack of skills impacts the administrative operation of the LFA, coaching best practice, and the referee's competence. A lack of	The LFA must engage with stakeholders to discuss opportunities for administrative courses to increase the capacity of the executive and standing committee members. A formal letter and personal visit to stakeholders, facilitating open discussion regarding needs, and memorandum of understanding signed to ensure accountability from both sides. This is useful not just for administrators but referees and coaches alike. Rhodes University may play a significant role as the local tertiary institution.

	opportunity and access to upskilling is a significant limiting factor.	
<i>Minimal Funding</i>	Consistent with the context of Makana, the economic status of the Makana LFA is poor. Minimal funding impacts facilities and infrastructure, incentives and remuneration as well as club support.	More proactive approaches to fundraising are needed—activities such as fun runs, tournaments to raise funds for the LFA, etc. We should also be engaging with diverse stakeholders to contribute not just financially, but also capacity building. Similar to above, the need for stakeholder interaction, MOU, and accountability. Fundraising meetings should be held to engage all members in brainstorming resource avenues to pursue.
<i>Lack of Assets</i>	Consistent with the lack of funding, the Makana LFA has a lack of assets. It does not have its own office, meeting venue, transportation, equipment, fields, or facilities.	Office space should be negotiated with local stakeholders such as the municipality, DSRAC, and Rhodes University. The additions of sponsorship and office space will allow for the consolidation and expansion of resources. The LFA predominantly spends its resources on consumables, which must be adjusted. Stakeholders should donate these. Executive members require access to the internet, and so airtime should be budgeted for, particularly for secretaries or general administrators. We should also look into Rhodes internet, which has some Hubs in JOZA, which may improve access. This will further contribute to capacity building and problem-solving.
<i>Competitions Committee Workload</i>	A significant constraint following analysis is the workload placed on the competitions committee, which is viewed as not sustainable. There is a high turnover of both volunteer general members and elected officials.	Improved recruitment and design of the LFA will inform improvements in this regard. The competitions committee is the heart of the LFA and performs the majority of activities. A significant number of executive members should serve on this committee at this community-based grassroots level. Effective delegation of duties and oversight is crucial to ensure accountability.
<i>Club Attitudes and Culture</i>	Overall, there is a sense of division between clubs and administrators in terms of local football. This combative approach leads to conflict and delays in decision making.	Strength through transparency and application of the constitution is the most appropriate strategy at this stage. The inefficiency of relevant stakeholders severely impacts the attitude towards the LFA. It is necessary to gain respect through transparency and hard work. This will, in time, result in additional members and mutual respect amongst LFA stakeholders. The participatory approach is thoroughly recommended to develop inclusive relations.

The above-listed strategies directly serve to counteract the effects of the noted constraints. It is vital to adopt an inclusive, participatory approach to ensure the sustainability of the solutions. This is the challenge for prescribing work. If those executing tasks are not invested in solutions, they are unlikely to be sustainable. In conjunction with tackling the identified constraints in previous perspectives, subject matter experts also engaged with potential affordances that exist and are available to the Makana LFA organization. The following table, therefore, notes opportunities present within the socio-technical system that may improve the functioning of the Makana LFA.

Table 29: Affordances and related strategy as identified by subject matter experts during cognitive work analysis process

<u>Affordance</u>	<u>Implementation Strategy</u>
<i>Modernization of Clubs – Technological Possibility</i>	The Makana LFA has typically operated on a pen and paper-based system in terms of keeping track of administration. Online programs such as MySAFA now create a more accessible system for administration, document generation, and storage. Access and familiarity with this technology is a challenge, and so workshops with clubs are necessary to familiarize them with aspects such as online banking, email systems as well as social media. This will improve communication as there is current reliance on word of mouth.
<i>Increased Tournaments</i>	Makana LFA usually runs leagues, and there is a lack of knock out tournament football. These develop a more instant interest in local football amongst the community. Additionally, these serve as fundraising opportunities, etc. It is necessary to include tournaments in the calendar, for all age groups.
<i>Constitutional Adjustments</i> <ol style="list-style-type: none"> 1. <i>Fine System</i> 2. <i>Dispute Costs</i> 3. <i>Player misrepresentation</i> 	<p>A member of the committee needs to draft a revised constitution. This will require time and input from all stakeholders.</p> <ol style="list-style-type: none"> 1. Misconduct is a significant issue, but that is mainly due to a lack of enforcement. It is possible to charge clubs for late affiliation and or dropping out of the league, generating funds and reducing misconduct issues.

	<p>2. Reduction of dispute costs and relevant documentation within the uniform rules.</p> <p>3. Issue of players misleading committee members during dispute processes. Fines may act as a deterrent.</p>
<i>Survival Guide</i>	In line with adjustments to constitutional documentation, it is recommended that a guide to clubs be generated to identify and explain important aspects of affiliation to the LFA. The explanation for affiliation and registration, as well as details of uniform rules and relevant roles and responsibilities. This may also be of benefit to Makana LFA committees, with a survival guide indicating administrative duties for each standing committee.
<i>Stakeholder Engagement</i>	There are several stakeholders outside of those previously identified that may be able to play a more active role in community football. A community information session should be held to identify these potential partners. For example, Ward councillors. The list of stakeholders can be seen in the results.
<i>Facilities</i>	Control at JD stadium may assist with regulating usage and directing funds through a small cost for each individual entering the venue. This is a challenge in the socioeconomic environment at Makana. Also, necessary to engage stakeholders on additional sites that may be used to reduce the overuse of our facilities.
<i>School Football</i>	School football should act as a feeder into the Makana LFA. The LFA should be proactive in engaging with the school sports structure. This may assist with reducing demand on facilities as well as keeping track of players.

There are several key recommendations to the Makana LFA, informed by the work as imagined perspective from CWA:

1) Improved Stakeholder Network - Paramount for capacity building and the harnessing of additional resources.

2) Standing Committee Reshuffle - Work domain analysis development suggests a reshuffle of function (pg. 111) within the LFA

3) Definitive year program - Represented in the contextual activity template phase (pg. 115).

4) Makana LFA Activities Guide – A more detailed understanding of associated activities provides guidelines for future committees in how these tasks are typically performed and how challenges are overcome (Strategies analysis, pg. 124).

5) Harnessing technology – Clubs should be required to be technologically up to date. The committee should assist with this transition.

6) Constitution Review - In the longer term, a review of the constitution is suggested to formalize these recommendations while also making relevant documentation appropriate for the English literacy level of the local context.

Part 2 - Contribution to the Discipline

Introduction

As described previously, the traditional experimental design was inadequate for impacting the functioning of the “local system” and addressing critical South African issues of inequality and social injustice in Makhandla. This is not to suggest that the traditional approaches are not useful, rather that, like Wilson (2014), for research to be considered HFE, it needs to consider context, be embedded and engage with complexity. We further argue that such an approach embraces the values of socio-technical systems theory and the broader philosophy of the HFE discipline. The current investigation, therefore, explored the application of HFE methods away from the traditional workplace, sporting contexts and issues of sustainability, to community-based projects that fulfil a very different role (physical activity platforms in resource-scarce communities).

Consequently, we adopted an embedded, participatory, systemic perspective to the investigation. This was an emergent characteristic due to our context, where values (such as seeing humans as assets and value to all stakeholders) are highly relevant. In our view, this research framework was effective in building trust within the local community, embedding researchers within the context, and informing suitable problem identification and research agendas (Vindrola-Padros *et al.*, 2017). Thus, this research program framework is a contribution to the discipline in how to structure engaged embedded research within contexts such as Makana. The following section will therefore review, 1) the research context and justification for approach, 2) the embedded research program, and 3) the study design.

Research Context

South Africa has unique historical legacies of oppression (Maylam, 2017), as well as high levels of poverty and inequality (Francis & Webster, 2019). Within non-metropolitan, remote areas such as Makana, these characteristics are more apparent (see pg.43 in RoL), with community members exposed to the quadruple burden of disease (Bradshaw *et al.*,

2003), high levels of unemployment (Lilenstein *et al.*, 2018), crime and drug culture (Bhorat *et al.*, 2017), as well as a lack of service delivery from municipal infrastructure (Govender, 2016). These factors play an important role in shaping interactions within the system and therefore are of vital importance from an HFE community-based research perspective.

The current study was conducted in the town of Makhanda, within the Makana Municipality of the Eastern Cape, South Africa. Importantly, Makhanda has the tertiary institution of Rhodes University within its community. According to Maylam (2016), Rhodes University was initially formed as an “Oxford in the bush university”, heavily based in imperialistic and western values. Prof. Devan Pillay, for instance, recalled his experience of Rhodes in 1980: “The buildings, halls and images made you feel that you might be in England, and indeed this was the intention: the university was established primarily to cater for the needs of English-speaking white students in the colony.” Maylam (2016) does note that over the past fifty years, traditions and characteristics have been challenged, subverted and overturned, at a slow, gradual pace. However, the institution is a long way from being an African university due to an ivory tower approach (Roodt, 2005). Research has historically been done on the community rather than with the community, and there is a lack of context-specific research informing community practice (Ryan, 2020; in press).

The aforementioned university research history, coupled with factors such as apartheid, poverty and the socio-economic divide, has led to an environment of mistrust with regards to researchers engaging with community members in Makana. Attempting to conduct research in this context can, therefore, be difficult, especially when other factors (such as race) are taken into account. Consequently, it was necessary to consider these contextual characteristics and tailor our research design appropriately.

Embedded Research Program

The present study was significantly influenced by Wilson (2014)'s six notions of HFE complex systems theory application: Systems focus, holism,

interactions, emergence, context and embedding. These establish the complex nature of sociotechnical systems, which are dynamic and unpredictable. As previously described, one of the most important notions is context. Appreciating the unique social influences, cultural artefacts, political and economic dynamics is imperative to engage with a context. Research of this nature should, therefore, adopt an ethnographic approach, which considers the unique characteristics of the context (Dekker & Nyce, 2004; Farrington-Darby & Wilson, 2009; Lützhöft *et al.*, 2010).

Typical research approaches within our discipline do not always account for such dynamic contexts, and so, therefore, we were required to draw on other models. As we acknowledged that we were working with the community, it became evident there was an entire pedagogy within community engagement and service-learning literature. For instance, Scott & Graham (2015) describe service-learning as: “collaborative enterprise between students and the community that involves explicit learning goals, a response to genuine community needs, youth decision-making, and systematic reflection on the part of the students”. Interestingly, it was evident that participatory ergonomics approaches correspond effectively to service-learning ideals, with the importance of inclusivity highlighted by Chambers & Lavery (2018). Furthermore, Bringle & Hatcher (1996) note the importance of service-learning within the academic curriculum, while Chambers & Lavery (2018) comment that service-learning is a form of embedded research.

The conceptual framework for the embedded program undertaken in this research is demonstrated in Figure 13 below. This outline goes beyond current typical models associated with HFE literature. This is due to several factors, including an acknowledgement that application was in a domain that is not financially motivated but rather a research context focused on social justice and capacity building. The framework is built on the integration of the pillars of academe, consolidating community engagement, service-learning and engaged research within the context of Rhodes University (Ryan and Todd, in press). Often these pillars of academic institutions act as silos, independent of one another.

The alignment of these pillars, however, is well established in service-learning (Moore & Ward, 2010; Soska *et al.*, 2010; Belone *et al.*, 2016) and community engagement literature (Zuber-skerritt, 2015). As the current research and associated research group developed over the last seven years, the emergent characteristics of the local system and the associated affordances indicated that taking such an integrated approach was appropriate. Furthermore, findings from our investigation emphasize that to contribute to the reconciliation of the research and practice gap, they should be integrated.

The model does not propose a one size fits all solution. Rather, that embodying the values of socio-technical systems: promoting quality of life, respecting all stakeholders, seeing technology as a tool and humans as assets (Read *et al.*, 2018) are important. And that these should be embedded in the approach adopted in HFE research and be part of the student experience during the research process. These philosophical underpinnings are a crucial tenant of the current study in that they promote life and express the role of HFE in contributing to societal needs, combating inequality, and fighting for social justice. Importantly, this section reflects collaborative work within the research group, with the current thesis the initial phase, to which the rest has been an emergent response to the identified community needs.

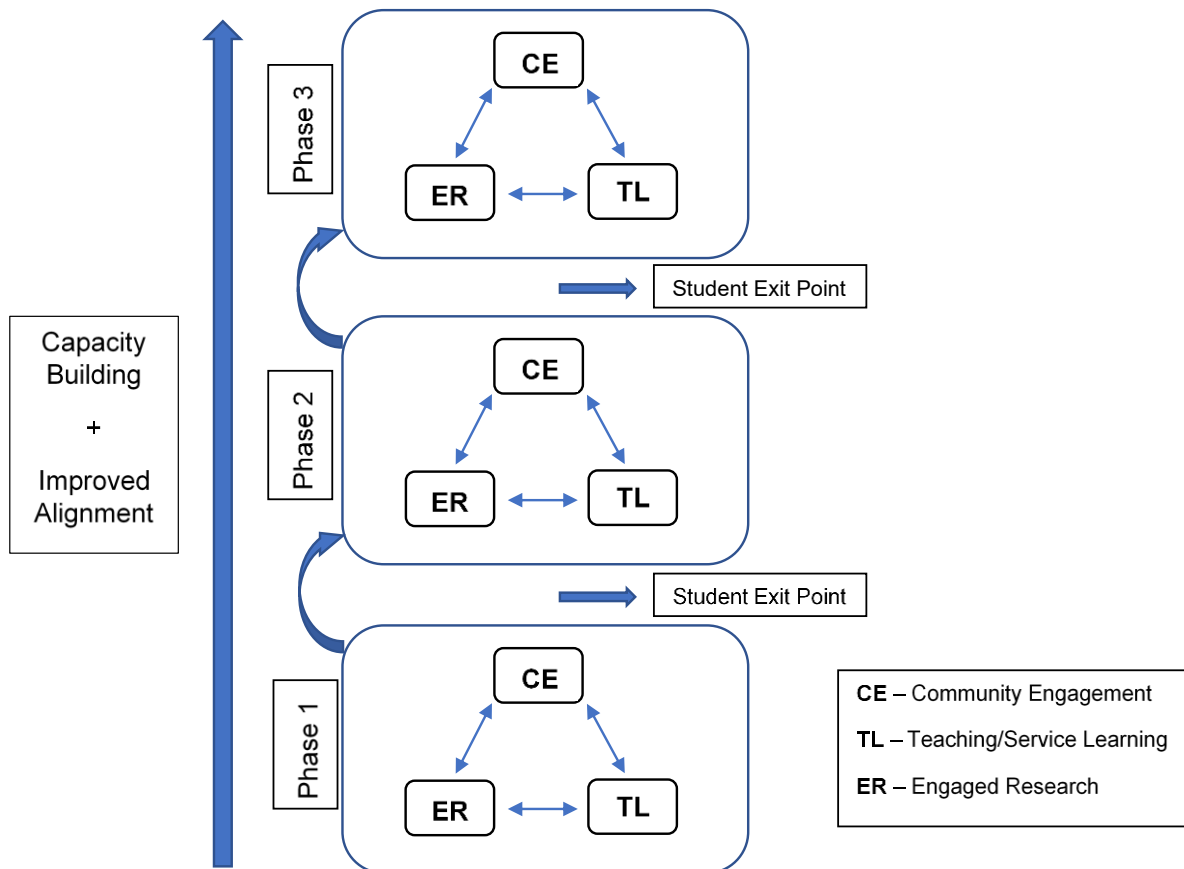


Figure 13: Proposed embedded research program theoretical framework.

As presented in Figure 13, the consolidation of the pillars of academe allows for the integration of students into their local community through community engagement projects; establishing service-learning opportunities within the curriculum. Embedded researchers then co-construct research agendas and perform engaged research. Research findings inform the evolution of the project, adjusting community engagement programs, and so over time, the program shifts phases as stakeholder capacity improves and community needs and research needs are aligned. By integrating projects into the tertiary curriculum, these programs become sustainable, gaining resources, improving relationships with community members and university stakeholders (Mettetal & Bryant, 1996; Zuber-skerritt, 2015). There are also opportunities for senior students to exit the program, empowering less experienced students to redefine

community engagement and service-learning components based on emergent characteristics of the system.

The current study promotes embedding to engage with community-based socio-technical systems, although, through the duration of the study, the concept of what it means to embed was challenging. From an HFE perspective, embedding traditionally denotes the role of a hired ergonomist within an organisation, where paid employees disclose information regarding the system (Wilson, 1994; Wilson, 2012). For a volunteer community-based organisation, a new conception was required. The purpose of embedding in this framework was to build relationships with community members and establishing trust in order to respond to the needs of the community, and to co-construct research questions (Duran *et al.*, 2019) and fulfil obligations to the local community (Belone *et al.*, 2016; Rutti *et al.*, 2016). As embedding may take on many forms, the researcher must be adaptive and reflective to community needs and dynamics (Fischer, 2005; Neumann & Village, 2012).

Breaking into the system is a challenge. In our opinion, this should involve a contribution to the socio-technical system without a preconceived research question. For example, for the current project, the researcher served as a strength and conditioning expert for a local football club. This evolved into a community engagement project, including undergraduate and postgraduate students as a form of service-learning. Consequently, research questions were identified and engaged with through projects such as Potgieter (2016), Callow (2019) and De Beer (2019). This demonstrates the foundation phase of the research program model seen above.

What is important to note is the constant iteration that occurs within each phase. The system is highly unpredictable and non-linear (Rasmussen, 1997; Salmon *et al.*, 2012). All components, therefore, include iterative loops as there is constant feedback through interactions and projects, informing adjustments within the program (Holling, 2001). As research projects are completed, a consideration is that students will leave the system. As this occurs, the completed research project should inform adjustments to the goals of all three-phase components. Thus, the program

shifts upwards within the model as the capacity of local stakeholders is built through interaction and research efforts. In addition, there is alignment and joint optimization of the research program to community needs. This is different from the traditional HFE conception, where joint optimisation refers to social and technical components (Walker *et al.*, 2008). Thus, the proposed model aims to develop HFE principles and philosophies within the resource-scarce community setting while simultaneously building the students' knowledge of values of sociotechnical systems theory. To contribute to closing the link between research and practice (Atkins *et al.*, 2016).

There are several benefits to the proposed model. First and foremost, as noted by Einfeld & Collins (2008) and Knapp *et al.* (2010), there is the empowerment of students and stakeholders alike throughout the process. The participatory research program promotes empathy and independence of researchers (Einfeld & Collins, 2008; Po & Ho, 2016) and has benefits to stakeholders such as accumulated knowledge over time and gradual development of infrastructure (Rutti *et al.*, 2016). An additional advantage of the embedded approach was the snowballing of stakeholder identification (Rutti *et al.*, 2016). By building relationships, you gain insight into how the system functions and can identify key stakeholders. Furthermore, engaging with the power dynamics of community partners is vital to participatory research (Belone *et al.*, 2016). We believe that this framework is highly useful to the integration of the pillars of academe, resulting in the development of both researchers and stakeholders alike.

Thus, a cycle is created where researchers are introduced through the embedded research program, gain empathy of the context, develop relationships with stakeholders, construct research problems, and conduct research that serves those needs, which are then directed back to the community. There are high levels of uncertainty around the benefits of such a project to new students. Fundamentally, an analysis of this nature requires a paradigm shift among researchers. To leave behind their preconceived notions of traditional research approaches and to explore more meaningful but challenging avenues. Through a participatory

framework, and the emphasis on socio-technical and complex systems theory values, a sustainable platform for co-constructed research and community development is ensured.

Study Design Review

The current study applied HFE methodologies to the unique context of a community-based socio-technical system in Makana, Eastern Cape. As the current investigation takes the form of a case study, it is prudent to review experimental procedures to provide recommendations for future research in such a context. The research approach is shown in Figure 14 below, describing the four fundamental steps: 1) Needs Identification, 2) Problem Clarification, 3) System Mapping, and 4) Redesign prioritization.

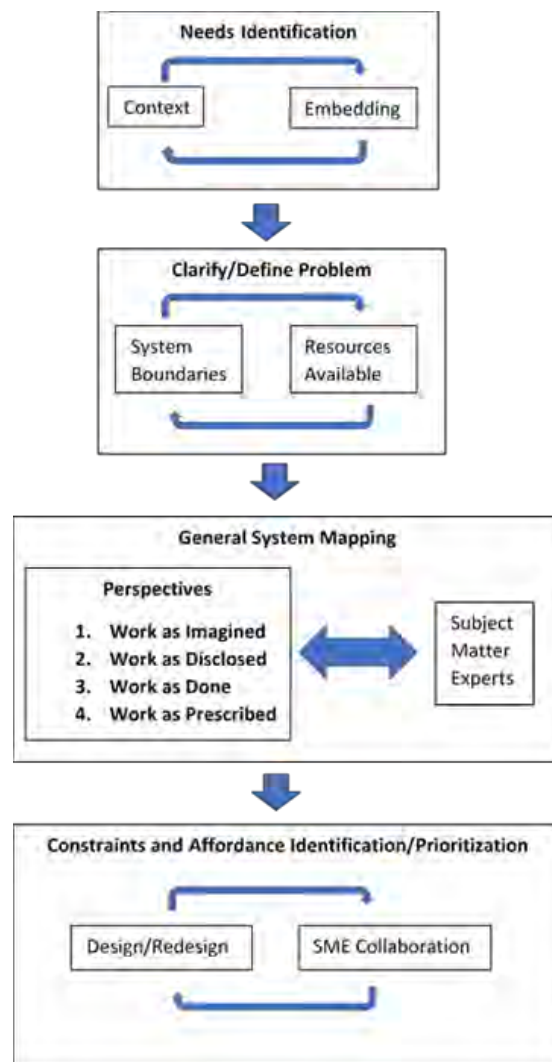


Figure 14: Study Design of the current investigation

The embedded research program described in the section above provided the platform for engaging with the local football community, building relationships, and understanding the context. Through this platform, the needs identification phase was completed and the aim of the study established. The second step of the study design is the clarification of the problem. An important consideration is the boundaries of the analysis, informed by the resources available, such as team members and experience, as well as financial and time constraints. Based on such considerations, as described within the methodology section (pg.64), Cognitive work analysis (CWA) was selected as a participatory method within the resource-scarce context of Makana.

Subject Matter Experts and the role of the Researcher

CWA involves conceptual modelling and the identification of constraints and affordances within sociotechnical systems (Salmon *et al.*, 2016). Within CWA literature, it is noted that the facilitator plays a fundamental role, highly dependent on the theoretical knowledge of participants (Read, Salmon, Lenné, & Jenkins, 2015). Furthermore, it is emphasised by authors such as Haines *et al.* (2002) and Hollnagel (2016), that practitioners at the “sharp-end” provide a vital perspective to the work system. The current study conceptualisation of embedding allows the researcher to become a subject matter expert, a practitioner at the sharp end. The result is a more detailed understanding of the activities and challenges within the system. The researcher may gain empathy into the cultural archetypes and stakeholder relationships within the system (Rutti *et al.*, 2016). The researcher thus plays a dual role as both an SME and the facilitator.

The requirements of the researcher as an SME can be summarised by Levin (2012): "participatory approaches require mastering relevant and significant scientific technical knowledge, knowing how to run participative processes, commanding strategic and political skills, as well as being capable of reflecting on ethical and moral challenges in the research process." It is evident that additional pressures are placed on the researcher when compared to classical research approaches (Cargo & Mercer, 2008).

However, the benefits of the current investigation and engaged embedded research of this nature are comprehensively summarised by (Vindrola-Padros *et al.*, 2017).

For example, embedding allows researchers to ask the “right” questions (Reiter-Theil, 2004), get unique perspectives, insights and data (Jenness, 2008), allowing researchers to engage with real problems in a real context (Hackett & Rhoten, 2011). Furthermore, insider knowledge allows the researcher to tailor the research to meet the needs of the organisation (Rowley, 2014), increasing the organisation’s capacity to inform policy and practice (Wong, 2009).

For instance, some feedback from a participant: "The researcher was able to explain complex notions related to CWA very clearly and in an easy-to-understand manner which was helpful moving forward. Also, the researcher's experience as an LFA member was vital as this allowed them to facilitate discussion regularly." Fundamentally, the embedded research approach addresses the barriers between researchers and practitioners, leading to the negotiation of knowledge and increasing the chances it will be used in practice (Marshall, 2014). It is our belief that the dual role of the researcher is highly beneficial to the application of HFE methodologies such as CWA and embodying sociotechnical system values.

It is important to note that the researcher, as an SME, does create a conflict of interest. Integration and decisions within the system will change their dynamics and resulting conceptual modelling. However, this is a necessary compromise within complex community-based STS due to the need to acknowledge the importance of context (Wilson, 2014; Stanton & Harvey, 2017), the background of participants (Read, Salmon, Lenné, & Stanton, 2015), and the barriers to research application (Paphitis & Kelland, 2016).

Bias is a significant concern, as the researcher may take a dominant role in the development of research (Jenness, 2008). However, the process of embedding empowers SMEs to speak their mind (Hackett & Rhoten, 2011). Furthermore, as stipulated in related literature, all steps within CWA should rely on group consensus (with acknowledged and reported compromises).

Honest, open dialogue is crucial to gain an accurate description of the system. Additionally, our role as embedded researchers was not to push for change but to assist in the natural development of the STS from within (Greenhalgh *et al.*, 2004). This method was essential for context-specific community based embedded socio-technical system research. In our view, without embedding, this research would not have been possible.

Furthermore, the researcher must be reflective, flexible and adaptive practitioners (Falzon, 2005), ensuring the method suits the context of its application (Salmon *et al.* 2017). This was the case for the current study, with minor adjustments made within the phases of CWA to suit the context of the Makana LFA and background of participants.

Cognitive Work Analysis review and Perspectives to Work

As noted in the methods section, adjustments were made to the CWA framework. These changes were informed by the context and the background of participants. It is evident from Part 1; that the adjusted CWA structure was useful in unpacking the constraints and affordances of the community-based context of the Makana LFA. This is an important finding of the current study as HFE complex systems tools can be adjusted effectively to suit the context of application. Furthermore, the complex terminology can be simplified to suit those without a systems theory educational background. Fundamentally, HFE complex systems tools have the potential to be useful in contexts as Makana, South Africa. The generalized nature and minimal resource requirements of the CWA framework are highly relevant and have potential for resource-scarce contexts such as middle to low-income countries.

A noteworthy adjustment to the CWA structure was the introduction of multiple perspectives to work. The importance of the multi-perspectival approach to the work system has been described by numerous authors such as Carayon (2006), Wilson (2014), Hollnagel (2016) and Kant (2018). The current study utilised differing perspectives to work within the CWA tool framework. This is a novel component of the present investigation. There

are significant benefits to utilising the perspectives approach to CWA. Firstly, the comparison of work as prescribed and work as disclosed is highly useful in identifying mismatches between how policymakers envision the system and how it is most likely to function. The breakdown between these two perspectives, in general, is an acknowledged weakness in organisational design (Rasmussen, 1997; Cassano-Piche *et al.*, 2009; Salmon *et al.* 2017), as the lack of participatory and stakeholder contribution often leads to oversight of potential dysfunction. The use of CWA within this framework was useful and has the potential to be explored in other areas of application.

A further important component was the use of work as imagined. For the current study, work as imagined was how subject matter experts imagine their system could be through optimising resources available to them. It is hoped that the inclusion of this step contributes to completing the loop between theory and practice as it allows for the conceptual modelling of the CWA to inform the redesign of the STS. Translating the outputs of human factors analyses has long been a challenge for the discipline (Dul *et al.*, 2012). This is, therefore, a potential contribution to the CWA design tool kit, as initially established by Read *et al.* (2015). and links more closely with the need to address issues of sustainability and social justice that are now key in universities in many countries in the Global South. In fact, this perhaps provides an illustration of the usefulness of CWA not only in addressing work system issues as typically done (or sports-related issues such as that by Salmon and colleagues) but also in engaged community-based research. As Davis *et al.* (2014) argued, there is a need for STS theory to be brave, and the current investigation demonstrates the potential for a shift towards an embedded participatory research framework.

Participants Perceptions

The use of perspectives is also highly beneficial and empowering to SMEs, particularly administrators who can envision how their system could be designed. Subject matter experts take ownership of their system and have an honest, reflective discussion about its purpose and functioning. This may

influence their decision making and the procedures that they put into place within the STS in the future. As described previously, the significant challenge within community-based socio-technical systems is the capacity for cultural change. The CWA framework places power in the hand of the SMEs, reimagining the role of the researcher. This allows for genuine perspectives and inclusive redesign opportunities. Furthermore, adjustments to the method (pg. 64) contributed to simplifying implementation, empowering subject matter experts of this context, and providing direct redesign outputs. This has an influence on the power dynamics within research contexts such as Makana, contributing to acknowledging administrators as subject matter experts of their sociotechnical system.

Following the completion of data collection, it was necessary to provide participants with an opportunity to review the process of CWA in its entirety. A workshop questionnaire was therefore completed to assess both the method and the facilitator, informing any potential improvements that could be made to the methodology. The workshop questionnaire and detailed responses are recorded in Appendix 11. The majority of responses are highly complementary to the transformative nature of the experimental process. The embedded nature of the researcher does pose a challenge in this sense, as it is possible that participants did not want to offend the researcher. However, some interesting suggestions were made, such as utilising more technology to speed up conceptual modelling. The researcher aimed to have data collection as pen and paper-based. Still, technological development is necessary, such as the use of overhead projectors, laptops, and potentially video to improve the completion of conceptual modelling. However, all subject matter experts reported that the process allowed an in-depth analysis of the Makana LFA, and illuminated both challenges and opportunities within the system.

Regarding the process as a whole, it may be viewed as successful as participants indicated their positive experiences. The suggestions for utilising the tool for other stakeholders is important for researchers moving forward. "Include other leaders like coaches and managers in analysis to

provide an opportunity to learn more about the LFA." Furthermore, the positive view on debate demonstrated the effectiveness of this setting in creating a platform for honest and transparent discussions that result in highly effective analysis. For example, "This workshop helped me to understand the work that the LFA does, and also to differentiate between the role of the club and the LFA. It was a good and most enjoyable workshop I have ever attended. Everything was clear from beginning to end."

Overall, the process was profoundly transformative for participants who viewed CWA as highly beneficial to their administrative roles. For instance, "To learn more about our jobs as leaders within the LFA and what rules and strategies we must take moving forward. Also, the importance of gaining more skills." It is, therefore, evident that CWA, as adapted within the context, may have the potential to contribute to participatory ergonomics approaches within a setting such as communities in South Africa.

Part 3 – Personal reflections on the journey: Basic science to embedded, engaged, responsive research design

Introduction

The positionality of the researcher is relevant and important (Berger, 2015) in framing the understanding of the system of football development in Makhanda. This section, therefore, explores these contextual factors, the positionality of the researcher and methodological development in more detail. HFE also recognises that it is necessary to understand the system from multiple perspectives, micro, meso and macro (Karsh *et al.*, 2014). HFE further promotes the simultaneous achievement of individual and organizational goals, and so a reflection on these interactions is vital.

Research Journey

Our departmental research has historically adopted a reductionist approach, heavily hypothesis-driven, with controlled laboratory experiments a significant focus (Ryan and Todd, in press). This is demonstrated by my master's thesis, which was a randomised controlled trial focusing on hamstring strengthening exercises within the Makana football context (Ryan, 2015). Despite the statistical success of the intervention, participants did not continue the exercise following the experimental period. This forced us to reflect on the meaning of research and how to ensure that research was translated into meaningful action. As noted by authors such as Wilson (2014), reductionism often fails to acknowledge the large number of factors influencing dynamic human-centred systems. And this was the case here.

My master's work was conducted within a sports science framework, which has traditionally been reductionist in approach (Balague *et al.*, 2013; Balagué *et al.*, 2017). We do not contend that this approach is not useful (it demonstratively is); rather, that it was not effective in translating into meaningful community-level change in the context within which our department and institution is situated in remote Eastern Cape province. Thus, we read and engaged with literature from several disciplines to better

understand contextual factors and barriers to impactful research. This literature journey is represented in Figure 15 below.

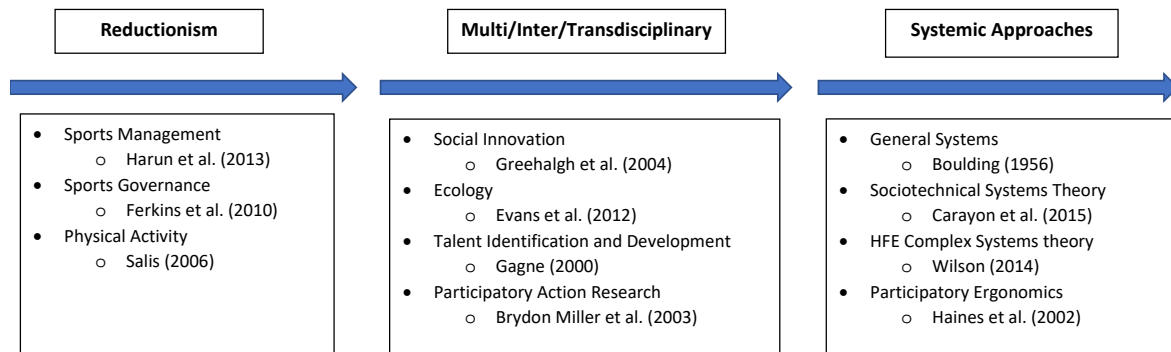


Figure 15: Illustrative example of the theoretical transition framework for the current investigation

Following my MSc research, it was necessary to engage with complexity in more detail. Initially, we read around typical sport science approaches. As we expanded our literature review, models such as physical activity behaviour by Sallis, Owen, & Fisher (2008) began to emphasise the complexity inherent to human-related physical activity systems. And so, we read in broader areas, into multi, inter and transdisciplinary science. Fields such as social innovation (Greenhalgh *et al.*, 2004) demonstrated the pitfalls of forcing change within complex environments.

Furthermore, the reliance on large interdisciplinary teams became evident for broader interventions due to the vast scope of interactions. Thus, for the current investigation, a holistic, systemic approach was needed as a starting point to a system in which little was known. Socio-technical systems theory and HFE complex systems theory, therefore, provided the framework for our investigation, engaging with complexities inherent to our context.

It should be emphasised that the reading of academic literature was not occurring in isolation. As a result of the interactions during my MSc work, a community engagement project was initiated. The development of the scope of reading for my PhD was, therefore, coupled with experiences “in context”. The community engagement project further emphasized the need for a shift to a participatory, holistic, systemic approach. This is made more apparent at an institution like Rhodes University which recently considers social

justice (through service learning, community engagement and research) a cornerstone of the philosophy for student education (Vice Chancellors Circular, 2020). In such a framework, research with a focus on working with historically disadvantaged communities is viewed as crucial for the sustainability of the broader community at large (Thatcher *et al.*, 2019).

Thus, there was a need to conduct community-related research and contribute to our local context (Ryan, 2020; in press). From an HFE perspective, Wilson argued for going into the wild (In retrospect, the phrase “into the wild” is not appropriate in the African context. This may have derogatory connotations. It is suggested, we instead refer to “into the context”). Wilson was referring to the need to perform HFE research within industry itself and not in the laboratory. Thatcher and Todd (2020) recently argued that this might be due to the financial opportunities that typically drive HFE system involvement. Importantly, authors such as Thatcher *et al.* (2020) argue for the need to look beyond the workplace to global issues of sustainability. However, none of these places emphasis on working with communities to achieve their goals.

It is our contention that considering the location of the university and the historical injustices that have shaped much of our history, it was necessary to go beyond these systems and to focus on being locally responsive. We wanted to meet this challenge. Importantly, however, HFE methodology has not typically been applied to community-based socio-technical systems with characteristics similar to ours. In fact, the term community-based socio-technical system (CBSTS) is not presently seen in the literature. Therefore, for the current investigation, CBSTS refers to non-governmental sporting volunteer organisations that provide services to the local community.

These systems often require interactions with multiple stakeholders and are based within a local government boundary (details of the current system are characterised in the review of literature). This lack of literature grounding was an additional challenge for the project, with a minimal framework for how to conduct our investigation. The critical initial question was, therefore, how do you integrate into the context to identify the research direction within the socio-political landscape that was characteristic of the current system?

Participatory Approaches

Participatory ergonomics is well established as a useful tool to gain access and to engage with unique contexts (Zalk, 2001; Haines, Wilson, Vink, & Koningsveld, 2002; Bamford & Griffin, 2008; Van Riet & Boettiger, 2009; Burgess-Limerick, 2018; Edwards, Prætorius, & Nielsen, 2020). Although participatory ergonomics has been applied in many contexts, minimal application has taken place within a community-based socio-technical system setting in South Africa that often has additional complexities such as historical oppression and distrust.

As we were applying HFE principles in a context that did not involve a traditional workplace, in which employers would see financial rewards of improved system performance and employees improved well-being, the application of a typical participatory approach may not have been effective. Authors such as Kogi & Yoshikawa (2016) have shown the need for the approach to be adapted to suit the area of application. It was, therefore, important to acknowledge that due to the historical approach adopted in many academic contexts in South Africa, a more nuanced approach that recognises the existing tensions between "town" and "gown" was needed (Paphitis & Kelland, 2016). Particularly as the researcher is a white male from a privileged background.

Our view was and is that tertiary institutions should better their communities through engaged, participatory research that aims to co-construct problems and solutions, allowing for sustainable redesign to socio-technical systems. As we read literature from these disciplines, it became evident that these approaches are aligned with the philosophy of both participatory HFE and socio-technical systems values, viewing humans as assets and ensuring value and respect to all stakeholders. Thus, we needed to create a platform to build trust and establish a cooperative dialogue.

Reconceptualising Embedding: Community-Engaged Research Group

Initially, I served as the strength and conditioning consultant for a local football club which had requested training assistance. The concept was to

contribute before I had an idea of what my research would entail. Rather than having a motive to a specific research question, it was to understand and engage with the local context. I spent three years developing a community engagement project to engage with this community request. This was a challenge as it is a somewhat lonely journey. It involved significant self-sacrifice of time and resources due to the low socio-economic nature of the community within which we reside. Furthermore, as there was no apparent link to the research agenda, there were high levels of uncertainty and anxiety. Is it worth it? Is it making a difference? Is it the right way to conduct myself as a researcher? The significant point is that I was uncomfortable and even vulnerable. No longer in the ivory tower of laboratory research (Roodt, 2005), but rather trying to make sense of the context (Wilson, 2014).

There is little doubt in hindsight that this participatory approach was highly effective. But this took considerable time to grow and establish. To consolidate the community engagement project, additional researchers joined the project to run strength and conditioning sessions three times per week. After three years of consistent work, the program was formalised as a departmental project with financial support for transport and equipment. These sessions were conducted at Rhodes University, bringing youth footballers for strength and conditioning training. The final transition occurred when we wished to serve more members of the youth football community. As a result, the project moved back into the Makhanda JOZA location (the poorer part of Makhanda), with a formal relationship established with the Makana LFA for the use of the local football field. This was an important moment because it shifted the focus from Rhodes centric to being community-focused and recognising that the experience of the students and their learning was as important as that of the community members.

The project continued to evolve as we became more responsive to community needs. Currently, these sessions now have both postgraduate and undergraduate students involved in the management of the program, with the recent introduction of indigenous African games, as well as

additional sports such as netball. It is a fixture of the university community engagement program, gaining resources both from the university community engagement office and our department. As we reviewed relevant HFE literature, it became evident that the approach we were adopting was embedding research in the community (Lazarus, Erasmus, Hendricks, Nduna, & Slammat, 2008; Lazarus, Duran, Caldwell, & Bulbulia, 2012).

The embedded nature of the work resulted in important developments in the program as outlined above and recognition from the university, with the researcher being awarded the university student researcher award for community engagement. This is not included to “show off” (in fact, my supervisor suggested that I include it) but rather to illustrate the effectiveness of an embedded HFE approach to community engagement within a university context, something that is worthy of further investigation in future work. Something we emphasised was the need for sustainability. If you generate and build relationships, it is vital to have a succession plan to maintain and provide a platform for additional research. To date, we have established a 10-student strong research group with diverse interests in areas such as waste management, university transdisciplinary research, healthcare, rugby, football, boxing and netball. All projects aim to take an embedded approach, co-constructing research problems with community partners.

This form of embedding goes beyond the traditional view held by HFE and espoused by Wilson. Wilson defined it as placement within the organization, adopting an observational role. However, to build trust and relationships that would allow for critical engagement with research problem formulation, it was deemed necessary to take a community engagement focus to embedding and service-learning. We were comfortable with this decision as it related well to the values of socio-technical systems theory as argued for by Read *et al.* (2018) and Lange-Morales *et al.* (2014). For example, value to stakeholders was ensured through responding to the community request to provide strength and conditioning sessions and formalising the nature of the project with both the Makana LFA and the Rhodes University Community Engagement Office. Fundamentally, embedding worked as we are now a

trusted research partner across multiple areas. Through this platform of co-construction of research questions, relevant research informs community practice with the sustainable project contributing to social justice in our community.

Reconceptualising Embedding: The Makana LFA

I knew that I didn't want to do a research project through the framework of strength and conditioning. This was just the opportunity that was available to integrate into the context. Performing training sessions on uneven ground with minimal/inadequate equipment, with youth players that have no boots, no medical aid, poor schooling, minimal family support is challenging work. Through this community engagement program, however, we gained insight into the local football system, and the Makana LFA became a vital stakeholder. Thus, it was essential to embed within this system, and I was elected to serve on the Makana LFA executive committee.

Once again, there were distinct feelings of isolation. Class, racial and language barriers presented significant challenges to me. I was sitting through meetings where I didn't understand a word. As a white South African from a different province, I am unable to speak isiXhosa, the local language in Makhanda and the typical language in which the meetings are conducted. Every time the group laughs, you assume; they are laughing at you. I was often concerned with making mistakes and offending community members. Initially, there was a sense of distrust towards me. This guy will disappear soon. He can't cut it. What does he have to offer? umLungu is the derogatory term for a white person in isiXhosa, meaning the scum on the waves of the ocean. And this was essentially my nickname for a time.

The reason: the legacies of apartheid and the creation of racial divides which are still strong within South African society. Coupled with a history of researchers (both student and more senior staff members) coming and doing research on community members and then disappearing again with no tangible benefits for the participants. However, over time and through active participation in the administration of the Makana LFA, these barriers began to be broken down. I think I realised that I was starting to truly embed

when community members directly engaged with me about the functioning of the committee rather than staying silent.

The benefit of the embedded approach in this context is evident to me. It is about building trust and gaining empathy, and creating the platform for honest dialogue. There is no doubt that there is high stress in these interactions: isolation, anxiety, frustration, even fear. But my view is that this is more difficult for the initial researcher. Once you have established the program, are a constant presence, the sense of distrust dissipates. And this was evident within the Makana LFA. Instead of umLungu, it becomes Ben.

Socio-technical Systems: Insight into Complexity

A further benefit of the embedded approach is a unique insight into the functioning of the system. Traditionally the subject matter expert is independent of the researcher. Through embedding, these are integrated, and the researcher becomes a subject matter expert (Levin, 2012). There is a compromise that exists in the sense that you alter the system state. But this is justified in this setting due to the need to break down significant barriers to research.

By serving on committees, interacting with players and coaches alike, I gained insight into the constraints and affordances that exist within the system. Insight into the tragedy of low socio-economic South Africa. Experiences such as providing transport to administrators, visiting their homes and meeting their families allowed me to gain empathy and respect for those within the system. Becoming a subject matter expert drove me to contribute, as you see the dedicated people at the sharp end, who selflessly give up their time and who deserve support. One also sees the realities of corruption and its impact within our society. For me, I gained a sense of my socio-economic privilege. The opportunities I have had compared to some who will never leave this town, who will most likely struggle to get an education and employment, who live in a rundown shack, who don't have a flush toilet, who have sewerage running through their yard, holes in their roofs, impacted by communicable and non-communicable diseases and yet

are still willing to contribute selflessly to the football family. I now appreciate why it is so challenging to change your situation from one of poverty to wealth.

Before this research project, I had delusions of grandeur. Of having a huge impact on South African football and transforming lives. Complex systems and the South African context have humbled me and taught me the true meaning of emergence. Some things are just outside of your control. Actual change comes from the system's cultural change capacity (Willis *et al.*, 2016). And so, this change capacity influences the sustainability of solutions. The only way to get effective change is for those in charge to take ownership of the solutions. Co-construction and participation are paramount to successful community-engaged research (Vindrola-Padros *et al.*, 2017), a significant outcome of this study.

Those involved with the program, in my opinion, are fundamentally changed. It is transformative not only to students but community partners and stakeholders. Seeing each other for who we are—fighting against adversity and injustice, striving for social cohesion and equity of opportunity. This research is just the tip of the iceberg, as there is much still to do. But it is evident, in my opinion, that there is great potential in the adoption of methodological approaches such as those within the current research.

The unification of the pillars of academe is essential in linking research and practice. Particularly from the applied HFE systems approach where we acknowledge the impact of broader latent factors, acknowledge humans as assets and see the system for what it is. Viewing SMEs for what they are: System experts with a valid and unique perspective which has much to contribute to the improvement of sociotechnical systems. Particularly in the identification of mismatches between work archetypes and providing important insights into what is valued at a community level allowing for more appropriate redesign of the system.

Barriers and Challenges

Research of this nature is not without its challenges. The biggest issue is the time taken for embedding and the new approach presented for the current study. As the Makana LFA is a volunteer organisation, there is no financial benefit. Furthermore, people are suspicious of you and your intentions. Community members are also sometimes active blockers (Murray-Webster & Simon, 2006), abusing their power and forgetting the purpose of community sport. Being in a position of power in an association also leaves you liable to criticism. This is a challenge for researchers embedding in an unfamiliar system. Decisions have consequences broader than your research project. For instance, relationships may become tarnished as you make decisions for the betterment of the association, not individual clubs. Decisions I made alienated some stakeholders or contributed to disciplinary issues. This can lead to isolation and vulnerability.

Additionally, this approach doesn't fit into the publish or perish status quo. I have spent six years embedding. If I had spent that time doing publications, I would hope to have at least one by now 😊 According to Maylam (2016), this is derived in large part from the make-up of the government subsidy formula, which brings significant financial returns to universities whose academics publish widely and where there is a high throughput of postgraduate students. This is a substantial challenge for embedded research programs moving forward. It is hoped that once the groundwork is laid, a higher rate of output can be achieved. It also has implications for funding. Why would a funding institution invest in a project where there is a minimal framework, direction or certainty? Sounds almost irresponsible. I am therefore eternally grateful to the National Research Foundation who made this research possible. We needed to argue the approach effectively, as well as being honour bound to our promises in completing the project, serving the community through a participatory approach.

I sense that not all researchers have the capacity to do embedding of this nature. Whether due to other commitments such as raising funds for their degrees or due to social and cultural community dynamics. In fact, this type of approach is not required for all research projects and is simply another important tool in the box for HFE researchers to utilise. These are important to consider as they play a role in the embedding of researchers. However, as the months and years went by, constant contact with youth players drove home, the importance of combating the status quo to the benefit of those who are disadvantaged.

These opportunities make you a better problem solver, a better critical thinker, a better human being. Understanding another person's challenges is only possible through interaction. Poverty and social disharmony mean something else here in South Africa. Unfortunately, the only way you understand is to live it, which is why context is so important. In my view, the philosophy of Systems HFE and the embedded approach provide an effective platform to achieve sustainable social change.

CHAPTER 5

CONCLUSIONS

Part 1 – Makana LFA Analysis

The current study emphasizes the usefulness of systems HFE tools and sociotechnical systems theory values to engage with complex societal issues beyond the traditional setting for HFE. An example of an understudied complex sociotechnical system is that of grassroots talent identification and development frameworks in South Africa. Due to the complexities of the context, a participatory embedded approach was utilized to co-construct the research problem. Following extensive embedding within the local football community, the purpose of the current study was established: To investigate the constraints and affordances on the functioning of the Makana Local Football Association (LFA) through the use of Cognitive Work Analysis.

Three perspectives were adopted for the application of CWA: 1) Work as prescribed – work as envisioned by policymakers, 2) Work as Disclosed – Reporting of how the Makana LFA currently functions according to subject matter experts and 3) Work as imagined – How subject matter experts imagine the Makana LFA system could be. Work as prescribed involved a document review, while work as disclosed and imagined involved workshops with subject matter experts to establish CWA related conceptual models. Some adjustments were made to the methodological process due to the context of application and background of participants.

Following the completion of experimentation, four key mismatches between how policymakers envision the Makana LFA and how subject matter experts report its functioning were identified. 1) **Purpose of the Makana LFA** – Policymakers view the Makana LFA as the foundation of the talent identification and development infrastructure of South Africa football. Subject matter experts view it as a community centred organization contributing to the socioeconomic status of community members with minimal focus on elite athlete development 2) **Human Capacity** – There is

a lack of active administrators with the Makana LFA system. Furthermore, active administrators have a lack of administrative qualifications. This reduces the ability to abide by the organizational structure prescribed by SAFA, 3) **Resources** – the resources prescribed by policymakers does not match the realities of resource availability at the Makana LFA level. This includes financial resources to provide incentives to clubs, and a lack of assets to adequately organize local football 4) **Infrastructure and Stakeholder Networking** – due to the lack of resources, there is a high reliance on external stakeholders to facilitate local football in Makana and abide by SAFA policy. These relationships are not formalized, and so there are challenges to access additional resources.

Through the identification of constraints and mismatches, it was clear that the Makana LFA is a complex adaptive socio-technical system. Across the general work system model, there are a number of non-linear, unplanned interactions. Furthermore, key system-wide constraints (including the lack of feedback loops and the characteristics of the Makana context) result in poor alignment between the perspectives of subject matter experts and SAFA policymakers. In spite of these challenges, administrators provide a sporting participation platform for over 1000 players. The Makana LFA, therefore, has a reimagined purpose, different from that prescribed by SAFA, that serves community needs, providing a sense of belonging and ubuntu. Consequently, an affordance of the current study is the local adaptation and resilience of administrators within the resource-scarce context of Makana, with acknowledgement of the need to adjust cultural factors towards an Afrocentric approach of ubuntu.

To reduce the gap between the perspectives of SAFA policymakers and subject matter experts, the following recommendations were made: 1) To view the LFA structure as a Community Sport Organization (CSO) to align the priorities of the LFA (community development) with those of the governing body SAFA (Talent identification and development). 2) To invest in capacity development of local administrators and community football members to improve the development, coordination, organization, and promotion of football in Makana, and 3) To increase the financial resources

and assets available to local administrators, and 4) To investigate formalization of stakeholder relationships across government, sporting organisations (such as SAFA), and local institutions. This may reduce the impact of mismatch 3 through the efficient allocation of resources within resource-scarce contexts. Furthermore, integration with local institutions (such as Rhodes University) may also provide a platform for capacity building and upskilling of community members.

In addition, conceptual model outputs from the CWA process of work as imagined provide guidelines/recommendations to adjustments to the prescribed documentation for the LFA. These include consolidation of the number of committees and their related purposes, the yearly calendar structure and delegation of responsibilities. Through the recommendations outlined above, the Makana LFA can improve its organizational design aligning its primary goals: 1) To contribute to community development and 2) to serve as the foundation of the talent identification and development infrastructure of South African football. Furthermore, an embedded systems HFE approach was successful in developing a locally responsive research group.

Part 2 – The Application of Systems HFE in Makana

As numerous authors have suggested, it is necessary to explore the use of HFE methodologies in new domains, and so the current investigation adopted sociotechnical systems theory values and participatory ergonomics as its philosophical underpinnings. The current investigation, therefore, developed an embedded research program to ensure sustainable, mutually beneficial community partnerships. Upon review, this emergent embedded research program was an effective platform for HFE application in this context. The integration of the pillars of academe allowed for the embedding of students into the context through community engagement, promoting service-learning opportunities and co-constructing research problems and solutions. Most importantly, the process is transformative for all stakeholders, building empathy for the South Africa context and making meaningful contributions to social change. Moreover, alignment between

research goals and community needs encourages the sustainability of the program. Embeddedness is therefore very important and relevant to the future of research in community-based STS.

Furthermore, the application of Cognitive Work Analysis (CWA) was highly effective in the resource-constrained environment of Makana. Using CWA to analyse community sport organisations and viewing the Makana LFA as a community-based STS are contributions to HFE and community ergonomics in particular. Additionally, as noted through the introduction of the multi-perspective approach to the WDA, tools such as CWA can be adapted to suit the context of low/middle-income countries and associated community-level projects. The framework of multiple perspectives to sociotechnical systems allowed for the identification of mismatches within the stakeholder hierarchy. As community partners are viewed as experts, they are empowered to take ownership of their system and to co-construct both barriers and opportunities. The adjusted CWA method was, therefore, highly effective in bringing to light characteristics of the system, identifying both problematic interactions and potential redesign opportunities in the community sport context. Additionally, the resulting participatory affordances and recommendations are useful in the alignment of perspectives and in hypothesis generation for future research.

Consequently, systems HFE is well placed to go outside of traditional workspaces and contribute to community-based projects and activities. Moreover, the philosophy of sociotechnical system theory and participatory ergonomics provide a platform to contribute to social justice and the betterment of resource-scarce communities.

Part 3 – Future Directions

Implications for SAFA – The current investigation has shown the usefulness of system HFE methodology in engaging with complex sociotechnical systems such as grassroots football associations. It is, therefore, recommended that such tools should be applied to parent and sibling systems to bring to light constraints and affordances associated with other

stakeholders. This may provide a platform for improved efficiency, adaptability and resilience within the SAFA system of systems.

Implications for the Makana LFA – The current analysis presents four fundamental mismatches relevant to the functioning of the Makana LFA. It is recommended that the Makana LFA engage with these mismatches and affordances associated with the current study. This has already begun, due to the embedded nature of the research group, with a study investigating capacity building (Non-formal education platforms) and detailed resource availability (Concrete resource scarcity parameters (tools and technology)). Such investigations denote that the results of this study have fed back into the system, helping to be locally responsive and aligning science and practice.

Implications for HFE - Contextually adapted tools may have important applications for projects relating to sustainability, a fundamental characteristic of community-based organizations. It is therefore recommended that HFE researchers engage with additional HFE and participatory methodology to investigate changing systems from within. This may have useful applications in places with gaps between communities and universities. Furthermore, an important component of the Francophone approach to HFE is the importance of the observation of activity. Future research should make use of organisational simulations that offer the potential for action, produce co-constructions, greater efficiency, validity and acceptability for all stakeholders concerned. Finally, there is a need for transdisciplinarity to engage with complex societal problems. As noted through the current research, interactions across multiple domains are evident within the Makana LFA, such as education, healthcare, infrastructure, tertiary and government institutions. Context-specific expertise across disciplines should be engaged to tackle wicked societal problems.

Part 4 - Limitations

The current investigation adopted an exploratory case study design. Therefore, the application of HFE methodologies only included the Makana

LFA context. A limitation is, therefore, the extrapolation potential of research findings as there are over 380 LFAs throughout South Africa with differing contextual characteristics. Consequently, system designers should acknowledge the adaptability and flexibility of administrators within other contexts. Furthermore, the small sample size associated with the current study may be a weakness. In line with expanding to additional LFAs, more administrators may provide additional constraints and affordances not considered by the current cohort. Moreover, an issue with workshops of this nature is that of groupthink. Individualized perspectives may not have been afforded an opportunity due to the pressure associated with small workshop discussions. Future research should engage with the influence of groupthink on small workshop cohorts.

Additionally, the current study utilized the perspective of Makana LFA current administrators to develop conceptual models of the LFA. A limitation is that there are several stakeholder perspectives on the functioning of the LFA system. These include the perspective of SAFA policymakers themselves, talent identification and development experts, regional administrators, municipal sports for development officials and club representatives such as owners, coaches and managers. Although the identification of these stakeholders is an important outcome of the study, it also perhaps presents a limitation. As specified by participants within the current study, future research should engage with additional stakeholder perspectives to gain a comprehensive insight into the optimal organizational design of LFA infrastructure.

Epilogue:

It is a Wednesday afternoon, just before 15:00. I have just collected the 16-seater bus, used to transport our volunteers up to JOZA for the Physical activity program. I used to drive up in my wife's car by myself and help out a single team with their strength and conditioning. On a random patch of ground, underneath some electricity pylons. How times have changed. As I pull up outside our department, the volunteers exit the building, carrying the various equipment needed for the session. My young padawan (the next leader of the program) is coordinating the afternoon session, so he is chatting to everyone, making sure they all know their roles. I'm just the bus driver these days. Everyone is really motivated for the session, discussing drills they watched on YouTube and arguing over who needs what equipment.

As we drive off, the discussions change. Discussing honours assignments, mean supervisors, varsity rugby results and even last night's trip to the club. The less said, the better... What I do love is how diverse the group is, with all levels of education from 1st years to PhD students. English speakers to isiXhosa speakers, we have the boxes covered. All interacting, catching up on what's happened over the last week since the previous session.

As usual, there are a number of pick-ups on the way. The regulars from opposite the Rhodes clock tower, our non-departmental volunteer from the four way stop near Fingo village. As we near the stadium, the kids see the bus and start running for the field. They all know the drill and start their two laps warm up. In the meantime, the volunteers set up their stations. Every week is always different. The number of kids, the age of the kids, it's always a mystery until we get there. But that's good because you should be a "reflective, adaptable practitioner" who "understands emergence and complexity" and embraces what you can't control: damn supervisor and his HFE life lessons. The sessions run themselves these days, not football anymore, but indigenous African games, netball and other fun activities. The joy is clear to see, both on the kids' faces and the volunteers.

I see the general secretary of the local football association enter the stadium and make his way over. He has got a big smile on his face, so something is up. "DSRAC phoned, they have the sponsorship stuff we requested". "Finally," I respond. It may be two months late, but the medals and trophies are most welcome considering the leagues are going to end in 2 weeks. You have to celebrate the small victories.

"I'm looking forward to the workshop," he says, "last night was really interesting". We are into the second week of the workshops for my analysis of the LFA, and we are really getting into the details of how it works. "I'm learning so much," he says. If nothing else, that makes it worth it.

The physical activity session ends with a game as usual. The referees are volunteers, with some taking it more seriously than others. Controversial calls result in much dissent from the side-lines. "Surely that was foul ref, what game are you watching". "Do you want to come and do it?" is the response. That silences the peanut gallery. We call time and say goodbye to the kids. "Same time next week". A few hugs and we are on our way back down. After dropping off the volunteers, I then do the rounds to collect my participants and head back up to the Eastern Cape Academy of Sport Indoor Centre. It has recently been built and is the perfect place to run the workshop.

As I walk in, I greet the manager of the centre. He is coordinating the local sportspeople who get to use the facility. We have the boxers here tonight, although the netball, football and rugby players also get their time in the gym. The aerobics class is also in full swing. I then greet the students who are on duty in the centre. They are challenging one of the boxers to a bench-press battle. My money is on the boxer. I open up the office and do a quick clean up. The 5 of us grab our usual seats and have a cup of coffee. As usual, we don't start with the workshop content; we chat about the state of the LFA. We have the AGM in a weeks' time. We also chat about the national 5 a side football tournament next month, the sponsorship coming from DSRAC, and the new year's cup at the end of the year. We have lots of plans for this LFA and for this community. The work never stops. Sport is life around here.

To end I would like to use a quote that my supervisor loves, by Anthony Bourdain:

~~Travel~~ Community based research isn't always pretty. It isn't always comfortable. Sometimes it hurts, it even breaks your heart. But that's okay. The journey changes you; it should change you. It leaves marks on your memory, on your consciousness, on your heart, and on your body. You take something with you. Hopefully, you leave something good behind."

REFERENCES

- Abbott, A., Button, C., Pepping, G., & Collins, D. (2005). Unnatural selection: Talent identification and development in sport. *Nonlinear Dynamics, Psychology, and Life Sciences*, 9(1), 61–88.
- Aginsky, K. D., Neophytou, N., & Thalia, C. (2014). Isokinetic hamstring and quadriceps muscle strength profiles of elite South African football players. *African Journal for Physical, Health Education, Recreation and Dance*, 20(3:2), 1225–1236.
- Ahlstrom, U. (2005). Work domain analysis for air traffic controller weather displays. *Journal of Safety Research*, 36(2), 159–169.
- Alegi, P. (2007). The political economy of mega-stadiums and the underdevelopment of grassroots football in South Africa. *Politikon*, 34(3), 315–331.
- Alegi, P. (2008). “A Nation to be reckoned with”: The politics of world cup stadium construction in Cape Town and Durban, South Africa. *African Studies*, 67(3), 397–422.
- Alegi, P. (2016). The Football Heritage Complex: History, Tourism, and Development in South Africa. *Africa Spectrum*, 41(3), 415–426.
- Allen, T. F. H., & Hoekstra, T. W. (1994). Toward a definition of sustainability. In Allen, T. F. H., & Hoekstra, T. W. (1994). *Toward a definition of sustainability*. Covington, WW; DeBano, LF, (tech. coords.). *Sustainable Ecological Systems: Implementing an Ecological Approach to Land Management*. Gen. Tech. Rep. RM-247. Fort Collins, CO: (pp. 98–107).
- Allspaw, J. (2016). Human Factors and Ergonomics Practice in Web Engineering and Operations: Navigating a Critical yet Opaque Sea of Automation (Chapter 25). In S. S. and C. Williams (Ed.), *Human factors and ergonomics in practice: Improving system performance and human well-being in the real world*. Boca Raton, FL: CRC Press.

- Anderson, E., & McCormack, M. (2010). Intersectionality, critical race theory, and American sporting oppression: Examining black and gay male athletes. *Journal of Homosexuality*, 57(8), 949–967.
- Anderson, J., & Watt, A. J. (2020). Using Safety-II and resilient healthcare principles to learn from Never Events. *International Journal for Quality in Health Care*, 00(00), 1–8.
- Annett, J., & Duncan, K. D. (1967). Task analysis and training design. *Occupational Psychology*, 41(July), 211–221.
- Araújo, D., Fonseca, C., Davids, K., Garganta, J., Volossovitch, A., Brandão, R., & Krebs, R. (2010). The Role of Ecological Constraints on Expertise Development. *Talent Development and Excellence*, 2(2), 165–179.
- Atkins, M. S., Rusch, D., Mehta, T. G., & Lakind, D. (2016). Future Directions for Dissemination and Implementation Science: Aligning Ecological Theory and Public Health to Close the Research to Practice Gap. *Journal of Clinical Child and Adolescent Psychology*, 45(2), 215–226.
- Balague, N., Torrents, C., Hristovski, R., Davids, K., & Araújo, D. (2013). Overview of complex systems in sport. *Journal of Systems Science and Complexity*, 26(1), 4–13.
- Balagué, N., Torrents, C., Hristovski, R., & Kelso, J. A. S. (2017). Sport science integration: An evolutionary synthesis. *European Journal of Sport Science*, 17(1), 51–62.
- Balfour, L., Farrar, T., McGilvray, M., Wilson, D., Tasca, G. A., Spaans, J. N., Mathews, C., Maziya, L., Khanyile, S., Dalgleish, T. L., & Cameron, W. D. (2013). HIV prevention in action on the football field: The Whizzkids United Program in South Africa. *AIDS and Behavior*, 17(6), 2045–2052.
- Balley, R., Erasmus, L., Lottich, L., Theron, N., & Joubert, G. (2009). Incidence of injuries among male soccer players in the first team of the University of the Free State in the Coca Cola League – 2007/2008 season. *South African Journal of Sports Medicine*, 21(1), 2007–2010.

- Bamford, D., & Griffin, M. (2008). A case study into operational team-working within a UK hospital. *International Journal of Operations and Production Management*, 28(3), 215–237.
- Bamford, D. R., & Forrester, P. L. (2003). Managing planned and emergent change within an operations management environment. *International Journal of Operations and Production Management*, 23(5–6), 546–564.
- Basopu, P. M. (2010). *Assessing challenges of corruption in the Eastern Cape Department of Education*.
- Bauman, A. E., Reis, R. S., Sallis, J. F., Wells, J. C., Loos, R. J. F., & Group, L. P. A. S. W. (2012). Correlates of physical activity: Why are some people physically active and others not? *The Lancet*, 380(9838), 258–271.
- Baxter, P., & Jack, S. (2008). Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. *The Qualitative Report*, 13(4), 544–559.
- Baysari, M. T., McIntosh, A. S., & Wilson, J. R. (2008). Understanding the human factors contribution to railway accidents and incidents in Australia. *Accident Analysis and Prevention*, 40(5), 1750–1757.
- Bean, C., & Forneris, T. (2016). Examining the Importance of Intentionally Structuring the Youth Sport Context to Facilitate Positive Youth Development. *Journal of Applied Sport Psychology*, 28(4), 410–425.
- Belmonte, F., Schön, W., Heurley, L., & Capel, R. (2011). Interdisciplinary safety analysis of complex socio-technological systems based on the functional resonance accident model: An application to railway trafficsupervision. *Reliability Engineering and System Safety*, 96(2), 237–249.
- Belone, L., Lucero, J. E., Duran, B., Tafoya, G., Baker, E. A., Chan, D., Chang, C., Greene-Moton, E., Kelley, M. A., & Wallerstein, N. (2016). Community-Based Participatory Research Conceptual Model: Community Partner Consultation and Face Validity. *Qualitative Health Research*, 26(1), 117–135.

- Bennett, K. J. M., Vaeyens, R., & Fransen, J. (2019). Creating a framework for talent identification and development in emerging football nations. *Science and Medicine in Football*, 3(1), 36–42.
- Berger, R. (2015). Now I see it, now I don't: researcher's position and reflexivity in qualitative research. *Qualitative Research*, 15(2), 219–234.
- Bergström, J., & Dekker, S. (2014). Bridging the macro and the micro by considering the meso: Reflections on the fractal nature of resilience. *Ecology and Society*, 19(4).
- Bhorat, H., Thornton, A., & Van der Zee, K. (2017). The socio-economic determinants of crime in South Africa. In *DPRU working paper*.
- Birrell, S., Young, M. S., & Jenkins, D. P. (2008). Improving driver behaviour by design: A Cognitive Work Analysis methodology. *Applied Human Factors and Ergonomics 2nd International Conference, 2010*, 14–17.
- Birrell, S., Young, M. S., Jenkins, D. P., & Stanton, N. A. (2012). Cognitive Work Analysis for safe and efficient driving. *Theoretical Issues in Ergonomics Science*, 13(4), 430–449.
- Bisantz, A. M., & Burns, C. M. (Ed.). (2008). *Applications of cognitive work analysis*. CRC Press.
- Blums, A., Belsky, J., Grimm, K., & Chen, Z. (2017). Building Links Between Early Socioeconomic Status, Cognitive Ability, and Math and Science Achievement. *Journal of Cognition and Development*, 18(1), 16–40.
- Bolsmann, C., & Parker, A. (2007). Soccer, South Africa and Celebrity Status: Mark Fish, Popular Culture and the Post-Apartheid State. *Soccer & Society*, 8(1), 109–124.
- Bradshaw, D., Groenewald, P., Laubscher, R., Nannan, N., Nojilana, B., Norman, R., Pieterse, D., Schneider, M., Bourne, D. E., Timæus, I. M., Dorrington, R., & Johnson, L. (2003). Initial burden of disease estimates for South Africa, 2000. *South African Medical Journal*, 93(9), 682–688.
- Braithwaite, J., Wears, R. L., & Hollnagel, E. (2015). Resilient health care: Turning patient safety on its head. *International Journal for Quality in Health Care*, 27(5), 418–420.

- Bridger, R. (2008). *Introduction to Ergonomics, Third Edition* (3rd ed.). CRC Press.
- Bringle, R. G., & Hatcher, J. A. (1996). Implementing service learning in higher education. *Journal of Higher Education*, 67(2), 221–239.
- Brown, B. B., Werner, C. M., Smith, K. R., Tribby, C. P., & Miller, H. J. (2014). Physical activity mediates the relationship between perceived crime safety and obesity. *Preventive Medicine*, 66, 140–144.
- Brown, B., & Duku, N. (2008). Negotiated identities: Dynamics in parents' participation in school governance in rural Eastern Cape schools and implication for school leadership. *South African Journal of Education*, 28(3), 431–450.
- Bruseberg, A., & Shepherd, A. (2017). Job design in integrated mail processing. *Engineering Psychology and Cognitive Ergonomics: Volume Five-Aerospace and Transportation Systems*.
- Burgess-Limerick, R. (2018). Participatory ergonomics: Evidence and implementation lessons. *Applied Ergonomics*, 68, 289–293.
- Burnett, C. (2009). Engaging sport-for-development for social impact in the South African context. *Sport in Society*, 12(9), 1192–1205.
- Burns, D. (2014). Systemic action research: Changing system dynamics to support sustainable change. *Action Research*, 12(1), 3–18.
- Calligeris, T., Burgess, T., & Lambert, M. (2015). The incidence of injuries and exposure time of professional football club players in the Premier Soccer League during football season. *South African Journal of Sports Medicine*, 27(1), 16.
- Callow, G. (2019). *An explorative study of Makana Local Football Association coaches' characteristics, experiences and needs*.
- Campbell, M. C., Hirbo, J. B., Townsend, J. P., & Tishkoff, S. a. (2014). The peopling of the African continent and the diaspora into the new world. *Current Opinion in Genetics & Development*, 29, 120–132.

Carayon, P. (2006). Human factors of complex sociotechnical systems. *Applied Ergonomics*, 37(4), 525–535.

Carayon, P. (2009). The Balance Theory and the Work System Model ... Twenty Years Later. *International Journal of Human–Computer Interaction*, 25(5), 313–327.

Carayon, P., Hancock, P., Leveson, N., Noy, I., Sznalwar, L., & van Hoogtem, G. (2015). Advancing a sociotechnical systems approach to workplace safety - developing the conceptual framework. *Ergonomics*, 58(4), 548–564.

Carayon, P., Schoofs Hundt, A., Karsh, B. T., Gurses, A. P., Alvarado, C. J., Smith, M., & Brennan, P. F. (2006). Work system design for patient safety: The SEIPS model. *Quality and Safety in Health Care*, 15(SUPPL. 1), 50–58.

Carayon, P., Wooldridge, A., Hoonakker, P., Hundt, A. S., & Kelly, M. M. (2020). SEIPS 3.0: Human-centered design of the patient journey for patient safety. *Applied Ergonomics*, 84, 103033.

Carden, T., Goode, N., & Salmon, P. M. (2017). Not as simple as it looks: led outdoor activities are complex sociotechnical systems. *Theoretical Issues in Ergonomics Science*, 18(4), 318–337.

Cargo, M., & Mercer, S. L. (2008). The Value and Challenges of Participatory Research: Strengthening Its Practice. *Annual Review of Public Health*, 29(1), 325–350.

Carmeli, A., Friedman, Y., & Tishler, A. (2013). Cultivating a resilient top management team: The importance of relational connections and strategic decision comprehensiveness. *Safety Science*, 51(1), 148–159.

Carroll, J. F., Chiapa, A. L., Rodriguez, M., Phelps, D. R., Cardarelli, K. M., Vishwanatha, J. K., Bae, S., & Cardarelli, R. (2008). Visceral fat, waist circumference, and BMI: impact of race/ethnicity. *Obesity (Silver Spring, Md.)*, 16(3), 600–607.

- Cartwright, N., & Munro, E. (2010). The limitations of randomized controlled trials in predicting effectiveness. *Journal of Evaluation in Clinical Practice*, 16(2), 260–266.
- Cassano-Piche, A. L., Vicente, K. J., & Jamieson, G. A. (2009). A test of rasmussen's risk management framework in the food safety domain: BSE in the UK. *Theoretical Issues in Ergonomics Science*, 10(4), 283–304.
- Catchpole, K., & Jeffcott, S. (2016). Human Factors and Ergonomics In Healthcare: Challenges and Opportunities (Chapter 13). In S. S. and C. Williams (Ed.), *Human factors and ergonomics in practice: Improving system performance and human well-being in the real world*. Boca Raton, FL: CRC Press.
- Chambers, D., & Lavery, S. (2018). Service-Learning: Enhancing Inclusive Education. *International Perspectives on Inclusive Education*, 12, 3–19.
- Chapanis, A. (1996). *Human factors in systems engineering*. John Wiley & Sons, Inc.
- Chauvin, C., Lardjane, S., Morel, G., Clostermann, J. P., & Langard, B. (2013). Human and organisational factors in maritime accidents: Analysis of collisions at sea using the HFACS. *Accident Analysis and Prevention*, 59, 26–37.
- Checkland, P. (2000). Systems Thinking, Systems Practice: Includes a 30-Year Retrospective. *The Journal of the Operational Research Society*, 51(5), 647.
- Cherns, A. (1976). The principles of sociotechnical design. *Human Relations*, 29(8), 783–792.
- Chung, A. Z. Q., & Shorrock, S. T. (2011). The research-practice relationship in ergonomics and human factors - surveying and bridging the gap. *Ergonomics*, 54(5), 413–429.
- Clark, C., & Burnett, C. (2010). Upward social mobility through women's soccer: psycho-social perspectives of sports. *African Journal for Physical Health Education, Recreation and Dance*, 16(1), 141–154.

- Clark, C, Burnett, C., & Burnett, C. (2011). The impact of football on the socialisation of female studentathletes in South Africa. *African Journal for Physical, Health Education, Recreation and Dance*, 16(4), 155–171.
- Clark, C (2011). Leading or losing? Women challenging male hegemony in South African football and the FIFA World Cup. *Soccer and Society*, 12(6), 834–849.
- Clark, J. (2007). Positional assessment and physical fitness characteristics of male professional soccer players in South Africa : sport science. *African Journal for Physical Health Education, Recreation*(13), 453–464.
- Clark, J. (2007). Higher log position is not associated with better physical fitness in professional soccer teams in South Africa. *South African Journal of Sports Medicine*, 19(2), 40.
- Clegg, C. W. (2000). Sociotechnical principles for system design. *Applied Ergonomics*, 31(5), 463–477.
- Clutterbuck, R., & Doherty, A. (2019). Organizational capacity for domestic sport for development. *Journal of Sport for Development*, 7(12), 16–32.
- Co, H. C., & Barro, F. (2009). Stakeholder theory and dynamics in supply chain collaboration. *International Journal of Operations and Production Management*, 29(6), 591–611.
- Cole, D. C., Theberge, N., Dixon, S. M., Rivilis, I., Neumann, W. P., & Wells, R. (2009). Reflecting on a program of participatory ergonomics interventions: A multiple case study. *Work*, 34(2), 161–178.
- Collin, A. (1998). New challenges in the study of career. *Personnel Review*, 27(5), 412–425.
- Conger, R. D., Conger, K. J., & Martin, M. J. (2010). Socioeconomic status, family processes, and individual development. *Journal of Marriage and Family*, 72(3), 685–704.
- Coopoo, Y., & Fortuin, C. S. (2012). Scientific support for youth football development programmes. *African Journal of Physical Education, Recreation and Dance*, 2, 149–160.

- Coovadia, H., Jewkes, R., Barron, P., Sanders, D., & McIntyre, D. (2009). The health and health system of South Africa: historical roots of current public health challenges. *The Lancet*, 374(9692), 817–834.
- Corlett, E. N., Wilson, J. R., & CORLETT, N. (Ed.). (1995). *Evaluation of human work*. CRC Press.
- Cornelissen, M., Salmon, P. M., McClure, R., & Stanton, N. A. (2013). Using cognitive work analysis and the strategies analysis diagram to understand variability in road user behaviour at intersections. *Ergonomics*, 56(5), 764–780.
- Cornelissen, S. (2007). Crafting legacies: The changing political economy of global sport and the 2010 FIFA World Cup. *Politikon*, 34(3), 241–259.
- Cornelissen, S., & Swart, K. (2006). The 2010 football world cup as a political construct: The challenge of making good on an African promise. *Sociological Review*, 54(SUPPL. 2), 108–123.
- Costella, M. F., Saurin, T. A., & de Macedo Guimarães, L. B. (2009). A method for assessing health and safety management systems from the resilience engineering perspective. *Safety Science*, 47(8), 1056–1067.
- Crust, L., & Lawrence, I. (2006). A review of leadership in sport: implications for football management. *Athletic Insight Journal*, 8(4), 28–48.
- Dallat, C. E., Salmon, P. M., Goode, N., Taylor, N., Lenn, M. G., Finch, C. F., & Lenné, M. G. (2017). Rasmussen's legacy in the great outdoors: A new incident reporting and learning system for led outdoor activities. *Applied Ergonomics*, 59, 637–648.
- Daniellou, F. (2005). The French-speaking ergonomists' approach to work activity: Cross-influences of field intervention and conceptual models. *Theoretical Issues in Ergonomics Science*, 6(5), 409–427.
- Daniellou, F., & Rabardel, P. (2005). Activity-oriented approaches to ergonomics: Some traditions and communities. *Theoretical Issues in Ergonomics Science*, 6(5), 353–357.

- Darby, P., & Solberg, E. (2010). Differing trajectories: Football development and patterns of player migration in south Africa and Ghana. *Soccer and Society*, 11(1–2), 118–130.
- David, A., Guilbert, N., Leibbrandt, M., Potgieter, E., & Hino, H. (2018). *Social cohesion and inequality in South Africa*.
- Davis, M. C., Challenger, R., Jayewardene, D. N. W., & Clegg, C. W. (2014). Advancing socio-technical systems thinking: A call for bravery. *Applied Ergonomics*, 45(2), 171–180.
- Davy, J., Gomes, J. O., Volosiuk, A., Jana, A., Ray, G., Ganguli, A. K., Zhang, W., & Todd, A. (2018). The BRICSplus Network: A Historical Overview and Future Perspectives of the Network's Role in Human Factors and Ergonomics. *In Congress of the International Ergonomics Association*, 1, 647–656.
- Davy, J., Weaver, K., Todd, A., & Paphitis, S. (2019). "Ergonomics on the ground": A case study of service learning in ergonomics education. *In Congress of the International Ergonomics Association*, 693–702.
- Dawson-Squibb, J. Schomer, H. (2004). Perceptions of success among South African soccer players: an exploratory study. *South African Journal for Research in Sport, Physical Education and Recreation*, 26(2), 17–31.
- De Beer, A. (2020). *The effect of age and maturation on anthropometric characteristics and physical abilities of youth South African footballers*.
- De Carvalho, P. V. R. (2011). The use of Functional Resonance Analysis Method (FRAM) in a mid-air collision to understand some characteristics of the air traffic management system resilience. *Reliability Engineering and System Safety*, 96(11), 1482–1498.
- Dekker, S., Cilliers, P., & Hofmeyr, J. H. (2011). The complexity of failure: Implications of complexity theory for safety investigations. *Safety Science*, 49(6), 939–945.
- Dekker, S., Hancock, P. A., & Wilkin, P. (2013). Ergonomics and sustainability: Towards an embrace of complexity and emergence. *Ergonomics*, 56(3), 357–364.

- Dekker, S., & Nyce, J. M. (2004). How can ergonomics influence design? Moving from research findings to future systems. *Ergonomics*, 47(15), 1624–1639.
- Desnoyers, L. (2004). The role of qualitative methodology in ergonomics: A commentary. *Theoretical Issues in Ergonomics Science*, 5(6), 495–498.
- Dhurup, M., & Mofoka, M. (2011). A factor analytical study of the dimensions of sportscares in selected soccer stadia in Gauteng, South Africa. *African Journal for Physical, Health Education, Recreation and Dance*, 17(1), 156–171.
- Dick, B., Stringer, E., & Huxham, C. (2009). Theory in action research. *Action Research*, 7(1), 5–12.
- Dollman, J., & Lewis, N. R. (2010). The impact of socioeconomic position on sport participation among South Australian youth. *Journal of Science and Medicine in Sport*, 13(3), 318–322.
- Donnelly, J. E., Hillman, C. H., Greene, J. L., Hansen, D. M., Gibson, C. A., Sullivan, D. K., Herrmann, S. D., Honas, J. J., Scudder, M. R., Betts, J. L., Henley, K., Hunt, S. L., & Washburn, R. A. (2017). Physical activity and academic achievement across the curriculum: Results from a 3-year cluster-randomized trial. *Preventive Medicine*, 99, 140–145.
- Donnelly, J., Hillman, C., Castelli, D., Etnier, J., Lee, S., Tomporowski, P., Lambourne, K., & Szabo-Reed, A. N. (2016). Physical Activity, Fitness, Cognitive Function, and Academic Achievement in Children: A Systematic Review. *Medicine and Science in Sports and Exercise*, 48(6), 1197–1222.
- Donnelly, P., & Kidd, B. (2003). Realizing the expectations: Youth, character, and community in Canadian sport. *The Sport We Want: Essays on Current Issues in Community Sport*, 25–44.
- Drummond, F., & Snowball, J. (2019). Cultural clusters as a local economic development strategy in rural small-town areas: Sarah Baartman district in South Africa. *Bulletin of Geography*, 43(1), 107–119.
- Dul, J., Bruder, R., Buckle, P., Carayon, P., Falzon, P., Marras, W. S., Wilson, J. R., & van der Doelen, B. (2012). A strategy for human

factors/ergonomics: Developing the discipline and profession. *Ergonomics*, 55(4), 377–395.

Duran, B., Oetzel, J., Magarati, M., Parker, M., Zhou, C., Roubideaux, Y., Muhammad, M., Pearson, C., Belone, L., Kastelic, S. H., & Wallerstein, N. (2019). Toward Health Equity: A National Study of Promising Practices in Community-Based Participatory Research. *Progress in Community Health Partnerships : Research, Education, and Action*, 13(4), 337–352.

Durandt, J., Tee, J. C., Prim, S. K., & Lambert, M. I. (2006). Physical fitness components associated with performance in a multiple-sprint test. *International Journal of Sports Physiology and Performance*, 1(2), 150–160.

Edwards, K., Prætorius, T., & Nielsen, A. P. (2020). A Model of Cascading Change: Orchestrating Planned and Emergent Change to Ensure Employee Participation. *Journal of Change Management*, 1–27.

Edwards, M. B. (2015). The role of sport in community capacity building: An examination of sport for development research and practice. *Sport Management Review*, 18(1), 6–19.

Eime, R. M., Young, J. A., Harvey, J. T., Charity, M. J., & Payne, W. R. (2013). A systematic review of the psychological and social benefits of participation in sport for adults: Informing development of a conceptual model of health through sport. *International Journal of Behavioral Nutrition and Physical Activity*, 10(1), 98.

Einfeld, A., & Collins, D. (2008). The relationships between service-learning, social justice, multicultural competence, and civic engagement. *Journal of College Student Development*, 49(2), 95–109.

Elm, W. C., Potter, S. S., Gualtieri, J. W., Roth, E. M., Easter, J. R., & Hollnagel, E. (2003). Applied cognitive work analysis: A pragmatic methodology for designing revolutionary cognitive affordances. In *Handbook of cognitive task design* (pp. 357–382).

Embrey, D. E. (1986). SHERPA: A systematic human error reduction and prediction approach. *Proceedings of the International Topical Meeting on Advances in Human Factors in Nuclear Power Systems*.

- Evans, G. W., & Kantrowitz, E. (2002). Socioeconomic Status and Health: The Potential Role of Environmental Risk Exposure. *Annual Review of Public Health, 23*(1), 303–331.
- Falzon, P. (2005). Developing ergonomics , developing people. *Proceedings of the 8th South East Asian Ergonomics Society Conference SEAES-IPS International Conference Bridging the Gap*, 1–10.
- Farrington-Darby, T., & Wilson, J. R. (2009). Understanding social interactions in complex work: A video ethnography. *Cognition, Technology and Work, 11*(1), 1–15.
- Faverge, J. M., & Ombredane, A. (1955). L'analyse du travail: facteur d'économie humaine et de productivité. *Faverge, Jean-Marie, and André Ombredane. "L'analyse Du Travail: Facteur d'économie Humaine et de Productivité."Éditions PUF, Paris.*
- Fidel, R., & Pejtersen, A. M. (2004). From information behaviour research to the design of information systems: The Cognitive Work Analysis framework. *Information Research, 10*(1).
- Finch, C. F., & Donaldson, A. (2010). A sports setting matrix for understanding the implementation context for community sport. *British Journal of Sports Medicine, 44*(13), 973–978.
- Fischer, G. (2005). From Reflective Practitioners to Reflective Communities. *Proceedings of the HCI International Conference, HCII*.
- Fisher, K., & Phelps, R. (2006). Recipe or performing art?: Challenging conventions for writing action research theses. *Action Research, 4*(2), 143–164.
- Flach, J. M. (2012). Complexity: Learning to muddle through. *Cognition, Technology and Work, 14*(3), 187–197.
- Fortuin, C. S., & Coopoo, Y. (2012). The management of youth football development programmes in Gauteng, South Africa. *African Journal for Physical, Health Education, Recreation and Dance, 2*, 73–84.
- França, J. E. M., & Hollnagel, E. (2019). Recognition and analysis of human factors and non-technical skills using the functional resonance analysis

method - FRAM. *IX International Conference on Knowledge and Innovation - CiKi*, 1(1).

Francis, D., & Webster, E. (2019). Poverty and inequality in South Africa: critical reflections. *Development Southern Africa*, 36(6), 788–802.

Fuller, C. W., Junge, A., Decelles, J., Donald, J., Jankelowitz, R., & Dvorak, J. (2010). “Football for health” - A football-based health-promotion programme for children in South Africa: A parallel cohort study. *British Journal of Sports Medicine*, 44(8), 546–554.

Gallagher, D., Visser, M., De Meersman, R. E., Sepúlveda, D., Baumgartner, R. N., Pierson, R. N., Harris, T., & Heymsfield, S. B. (1997). Appendicular skeletal muscle mass: effects of age, gender, and ethnicity. *Journal of Applied Physiology*, 83(1), 229–239.

Gallo, L. C., & Matthews, K. A. (2003). Understanding the association between socioeconomic status and physical health: Do negative emotions play a role? *Psychological Bulletin*, 129(1), 10–51.

Giampiccoli, A., & Nauright, J. (2019). Beyond the reach of FIFA: football and community ‘development’ in rural South Africa, towards a politics of inclusion and sustainability. *Soccer and Society*, 20(2), 288–306.

Girault, P. (1998). Ergonomics: Not a New Science. *Ergonomics in Design*, 6(2), 6–30.

Gledhill, A., Harwood, C., & Forsdyke, D. (2017). Psychosocial factors associated with talent development in football: A systematic review. *Psychology of Sport and Exercise*, 31, 93–112.

Goedecke, J. H., White, N. J., Chicktay, W., Mahomed, H., Durandt, J., & Lambert, M. I. (2013). The effect of carbohydrate ingestion on performance during a simulated soccer match. *Nutrients*, 5(12), 5193–5204.

Gordon, R. E., Kassier, S. M., & Biggs, C. (2015). Hydration status and fluid intake of urban, underprivileged South African male adolescent soccer players during training. *Journal of the International Society of Sports Nutrition*, 12(1), 1–10.

- Gordon, R., Flin, R., & Mearns, K. (2005). Designing and evaluating a human factors investigation tool (HFIT) for accident analysis. *Safety Science*, 43(3), 147–171.
- Govender, I. G. (2016). Monitoring and Evaluating Service Delivery as a Wicked Problem in South Africa. *Journal of Human Ecology*, 55(1–2), 21–34.
- Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., & Kyriakidou, O. (2004). Diffusion of innovations in service organizations: Systematic review and recommendations. *Milbank Quarterly*, 82(4), 581–629.
- Griffin, T. G. C., Young, M. S., & Stanton, N. A. (2010). Investigating accident causation through information network modeling. *Ergonomics*, 53(2), 198–210.
- Gustavsen, B. (2003). New forms of knowledge production and the role of action research. *Action Research*, 1(2), 153–164.
- Gwanzura, O. (2009). *An Exploration of Ethical Conduct in the South African Public Sector: a Case of the Eastern Cape Department of Education a Mini-Dissertation Submitted in Partial Fulfilment of the Requirements for the Degree of Master of Public Administration in the Facul* (Issue December).
- Hackett, E. J., & Rhoten, D. R. (2011). Engaged, Embedded, Enjoined: Science and Technology Studies in the National Science Foundation. *Science and Engineering Ethics*, 17(4), 823–838.
- Haines, H., Wilson, J. R., Vink, P., & Koningsveld, E. (2002). Validating a framework for participatory ergonomics (the PEF). *Ergonomics*, 45(4), 309–327.
- Hall, M., Andrukow, A., Barr, C., Brock, K., Wit, M. de, Embuldeniya, D., Jolin, L., Lasby, D., Lévesque, B., Malinsky, E., Stowe, S., & Vaillancourt, Y. (2003). *The capacity to serve. A Qualitative Study of the Challenges Facing Canada's Nonprofit and Voluntary Organizations*.
- Halldorsson, V., Thorlindsson, T., & Katovich, M. A. (2014). The role of informal sport: The local context and the development of elite athletes. In

Studies in Symbolic Interaction (Vol. 42). Emerald Group Publishing Limited.

Hamilton, B. (2000). East African running dominance: what is behind it? *British Journal of Sports Medicine*, 34(5), 391–394.

Hart, G. P. (2002). *Disabling globalization: Places of power in post-apartheid South Africa* (Vol. 10). Univ of California Press.

Haslam, R., & Waterson, P. (2013). Ergonomics and Sustainability. *Ergonomics*, 56(3), 343–347.

Hassall, M. E., & Sanderson, P. M. (2014). A formative approach to the strategies analysis phase of cognitive work analysis. *Theoretical Issues in Ergonomics Science*, 15(3), 215–261.

Helander, M. G. (1997). Forty years of IEA: Some reflections on the evolution of ergonomics. *Ergonomics*, 40(10), 952–961.

Hendrick, H. W. (1991). Ergonomics in organizational design and management. *Ergonomics*, 34(6), 743–756.

Hendrick, H. W. (1997). Macroergonomics : a proposed approach for use with anthropotechnology and ergonomic work analysis in effecting technology transfer. *Le Travail Humain*, 60(3), 255–272.

Hendrick, H. W. (2008). Applying ergonomics to systems: Some documented “lessons learned.” *Applied Ergonomics*, 39(4), 418–426.

Hendrick, H. W., & Kleiner, B. M. (2002). *Macroergonomics: Theory, methods, and applications*. Lawrence Erlbaum Associates Publishers.

Herrera, I. A., & Woltjer, R. (2009). Comparing a multi-linear (STEP) and systemic (FRAM) method for accident analysis. *Safety, Reliability and Risk Analysis: Theory, Methods and Applications - Proceedings of the Joint ESREL and SRA-Europe Conference*, 1(12), 19–26.

Herrington, S., & Brussoni, M. (2015). Beyond Physical Activity: The Importance of Play and Nature-Based Play Spaces for Children’s Health and Development. *Current Obesity Reports*, 4(4), 477–483.

- Hershow, R. B., Gannett, K., Merrill, J., Kaufman, E. B., Barkley, C., DeCelles, J., & Harrison, A. (2015). Using soccer to build confidence and increase HCT uptake among adolescent girls: a mixed-methods study of an HIV prevention programme in South Africa. *Sport in Society*, 18(8), 1009–1022.
- Higgins, P. G. (1998). Extending cognitive work analysis to manufacturing scheduling. *Proceedings - 1998 Australasian Computer Human Interaction Conference*, 236–243.
- Hignett, S., & Wilson, J. R. (2004a). Horses for courses – but no favourites. A reply to three commentaries. *Theoretical Issues in Ergonomics Science*, 5(6), 517–525.
- Hignett, S., & Wilson, J. R. (2004b). The role for qualitative methodology in ergonomics: A case study to explore theoretical issues. *Theoretical Issues in Ergonomics Science*, 5(6), 473–493.
- Hill, L. (2010). Football as code: The social diffusion of “soccer” in South Africa. *Soccer and Society*, 11(1–2), 12–28.
- Hobbs, A. (2008). An Overview of Human Factors in Aviation Maintenance. In *ATSB Safety Report, Aviation Research and Analysis Report AR* (Issue 55).
- Höglund, K., & Sundberg, R. (2008). Reconciliation through Sports? The case of South Africa. *Third World Quarterly*, 29(4), 805–818.
- Holden, R. J., Carayon, P., Gurses, A. P., Hoonakker, P., Hundt, A. S., Ozok, A. A., & Rivera-Rodriguez, A. J. (2013). SEIPS 2.0: a human factors framework for studying and improving the work of healthcare professionals and patients. *Ergonomics*, 56(11), 1669–1686.
- Holling, C. S. (2001). Understanding the complexity of economic, ecological, and social systems. *Ecosystems*, 4(5), 390–405.
- Hollnagel, E., Woods, D. D., & Leveson, N. (Ed.). (2006). *Resilience engineering: Concepts and precepts*. Ashgate Publishing, Ltd.
- Hollnagel, E. (2012). Coping with complexity: Past, present and future. *Cognition, Technology and Work*, 14(3), 199–205.

- Hollnagel, E. (2014). Human factors/ergonomics as a systems discipline? “The human use of human beings” revisited. *Applied Ergonomics*, 45(1), 40–44.
- Hollnagel, E. (2016). The Nitty-Gritty of Human Factors (Chapter 4). In S. S. and C. Williams (Ed.), *Human factors and ergonomics in practice: Improving system performance and human well-being in the real world*. Boca Raton, FL: CRC Press.
- Hollnagel, E., & Goteman, Ö. (2004). The Functional Resonance Accident Model. *Proceedings of Cognitive System Engineering in Process Plant*, 155–161.
- Hollnagel, E., Pruchnicki, S., Woltjer, R., & Etcher, S. (2008). Analysis of Comair flight 5191 with the Functional Resonance Accident Model. *Proceedings of the 8th International Symposium of the Australian Aviation Psychology Association*.
- Hollnagel, E., Wears, R. L., & Braithwaite, J. (2015). *From Safety-I to Safety-II : A White Paper*.
- Hopkins, A. (2000). An AcciMap of the Esso Australia Gas Plant Explosion. In G. G. M. Ed. By Svedung, I., Cojazzi (Ed.), *Proceedings of the 18 th ESReDA Seminar, Karlstad, Sweden*, (pp. 1–10).
- Houlihan, B., & Zheng, J. (2013). The olympics and elite sport policy: Where will it all end? *International Journal of the History of Sport*, 30(4), 338–355.
- Hulme, A., McLean, S., Read, G. J. M., Dallat, C., Bedford, A., & Salmon, P. M. (2019). Sports Organizations as Complex Systems: Using Cognitive Work Analysis to Identify the Factors Influencing Performance in an Elite Netball Organization. *Frontiers in Sports and Active Living*, 1(56), 1–12.
- Hulme, A., Thompson, J., Plant, K. L., Read, G. J. M., Mclean, S., Clacy, A., & Salmon, P. M. (2019). Applying systems ergonomics methods in sport: A systematic review. *Applied Ergonomics*, 80(January 2018), 214–225.
- Hulse, K., & Stone, W. (2007). Social cohesion, social capital and social exclusion: A cross cultural comparison. *Policy Studies*, 28(2), 109–128.

- Humphreys, B. R., McLeod, L., & Ruseski, J. E. (2014). Physical activity and health outcomes: evidence from Canada. *Health Economics*, 21(1), 33-54.
- Hunt, B. (2011). Publishing qualitative research in counseling journals. *Journal of Counseling and Development*, 89(3), 296–300.
- Isabirye, A. K., & Surujlal, J. (2012). Determinants of attendance at Premier Soccer League matches in South Africa: A qualitative investigation. *African Journal for Physical, Health Education, Recreation and Dance*, 2012(2), 57–72.
- Jenkins, D. P., Salmon, P. M., Stanton, N. A., & Walker, G. H. (2010). A systemic approach to accident analysis: A case study of the Stockwell shooting. *Ergonomics*, 53(1), 1–17.
- Jenkins, D. P., Stanton, N. A., Salmon, P. M., & Walker, G. H. (2008). *Cognitive work analysis: Coping with complexity*. Ashgate Publishing, Ltd..
- Jeness, V. (2008). Pluto, Prisons, and Plaintiffs: Notes on Systematic Back-Translation From an Embedded Researcher. *Social Problems*, 55(1), 1–22.
- Jere, M. G., & Mathidza, S. (2014). Investigating motivational factors that influence football match attendance in the South African Premier Soccer League post the 2010 FIFA world cup. *Mediterranean Journal of Social Sciences*, 5(20), 563–569.
- Jiancaro, T., Jamieson, G. A., & Mihailidis, A. (2014). Twenty years of cognitive work analysis in health care: A scoping review. *Journal of Cognitive Engineering and Decision Making*, 8(1), 3–22.
- Johnson, C. W., & de Almeida, I. M. (2008). An investigation into the loss of the Brazilian space programme's launch vehicle VLS-1 V03. *Safety Science*, 46(1), 38–53.
- Jones, G. J., Edwards, M. B., Bocarro, J. N., Bunds, K. S., & Smith, J. W. (2018). Leveraging community sport organizations to promote community capacity: Strategic outcomes, challenges, and theoretical considerations. *Sport Management Review*, 21(3), 279–292.

- Jones, R. I., Ryan, B., & Todd, A. I. (2015). Muscle fatigue induced by a soccer match-play simulation in amateur Black South African players. *Journal of Sports Sciences*, 33(12), 1305–1311.
- Kant, V. (2018a). The sociotechnical constitution of cognitive work analysis: roles, affordances and malfunctions. *Theoretical Issues in Ergonomics Science*, 19(2), 195–212.
- Kant, V. (2018b). Varieties of being “social”: Cognitive work analysis, symbolic interactionism, and sociotechnical systems. *Human Factors and Ergonomics In Manufacturing*, 28(6), 309–326.
- Karsh, B. T., Waterson, P., & Holden, R. J. (2014). Crossing levels in systems ergonomics: A framework to support “mesoergonomic” inquiry. *Applied Ergonomics*, 45(1), 45–54.
- Karwowski, W. (2005). Ergonomics and human factors: The paradigms for science, engineering, design, technology and management of human-compatible systems. *Ergonomics*, 48(5), 436–463.
- Kazaras, K., Kirytopoulos, K., & Rentizelas, A. (2012). Introducing the STAMP method in road tunnel safety assessment. *Safety Science*, 50(9), 1806–1817.
- Kim, H.-T., Na, S., & Ha, W.-H. (2011). A Case Study of Marine Accident Investigation and Analysis with Focus on Human Error. *Journal of the Ergonomics Society of Korea*, 30(1), 137–150.
- Kirwan, B., & Ainsworth, L. K. (Ed.). (1992). *A guide to task analysis: the task analysis working group*. CRC Press.
- Kirwan, B. (2000). Soft systems, hard lessons. *Applied Ergonomics*, 31(6), 663–678.
- Knapp, T., Fisher, B., & Levesque-Bristol, C. (2010). Service-learning’s impact on college students’ commitment to future civic engagement, self-efficacy, and social empowerment. *Journal of Community Practice*, 18(2), 233–251.
- Kogi, K. (2006). Participatory methods effective for ergonomic workplace improvement. *Applied Ergonomics*, 37(4), 547–554.

- Kogi, K., & Yoshikawa, T. (2016). Low-Cost Improvements for Reducing Multifaceted Work-Related Risks and Preventing Stress at Work. *Journal of Ergonomics*, 06(01), 1–7.
- Kubayi, A. (2015). *Barriers and hindrances experienced by sport coaches in gauteng province*.
- Kubayi, A., Coopoo, Y., & Morris-Eyton, H. (2017). Work-related constraints in sports coaching: Perceptions of South African female coaches. *International Journal of Sports Science and Coaching*, 12(1), 103–108.
- Kubayi, A., Paul, Y., Mahlangu, P., & Toriola, A. (2017). Physical Performance and Anthropometric Characteristics of Male South African University Soccer Players. *Journal of Human Kinetics*, 60(1), 153–158.
- Kubayi, N. A., & Coopoo, Y. (2016). *Motivational factors among sport coaches in Gauteng Province of South Africa*. 22(1), 33–39.
- Lange-Morales, K., Thatcher, A., & García-Acosta, G. (2014). Towards a sustainable world through human factors and ergonomics: it is all about values. *Ergonomics*, 57(11), 1603–1615.
- Lategan, L. (2011). Physiological profiles of South African soccer referees and assistant referees. *African Journal for Physical, Health Education, Recreation & Dance*, 17(4), 675–693.
- Lazarus, J., Erasmus, M., Hendricks, D., Nduna, J., & Slamati, J. (2008). Embedding community engagement in South African higher education. *Education, Citizenship and Social Justice*, 3(1), 57–83.
- Lazarus, S., Duran, B., Caldwell, L., & Bulbulia, S. (2012). Public health research and action: Reflections on challenges and possibilities of community-based participatory research. In *Public health-social and behavioral health* (pp. 309–324).
- Le Grange, S. (2018). *Work Domain Analysis : strengthening the embedding process*.
- Le Roux, K. (2007). Motivational strategies of sport coaches in South Africa. *South African Journal for Research in Sport, Physical Education and Recreation*, 29(1), 83–95.

- Leclerc-Madlala, S., Simbayi, L., & Cloete, A. (2009). The Sociocultural Aspects of HIV/AIDS in South Africa 25 Years On: Psychosocial Perspectives. In *HIV/AIDS in South Africa 25 ...* (pp. 13–26).
- Lemon, A. (2004). Redressing school inequalities in the Eastern Cape, South Africa. *Journal of Southern African Studies*, 30(2), 269–290.
- Lenné, M. G., Salmon, P. M., Liu, C. C., & Trotter, M. (2012). A systems approach to accident causation in mining: An application of the HFACS method. *Accident Analysis and Prevention*, 48, 111–117.
- Leveson, N. (2004). A new accident model for engineering safer systems. *Safety Science*, 42(4), 237–270.
- Leveson, N., Dulac, N., Zipkin, D., Cutcher-Gershenfeld, J., Carroll, J., & Barrett, B. (2006). Engineering resilience into safety-critical systems. *Resilience Engineering: Concepts and Precepts*, 95–124.
- Levin, M. (2012). Academic integrity in action research. *Action Research*, 10(2), 133–149.
- Light, P. (2004). *Sustaining nonprofit performance: The case for capacity building and the evidence to support it*. Brookings Institution Press.
- Lilenstein, K., Woolard, I., & Leibbrandt, M. (2018). In-work poverty in South Africa: The impact of income sharing in the presence of high unemployment. *Handbook on In-Work Poverty*, 193, 416–433.
- Lintern, G. (2008). The Theoretical Foundation of Cognitive Work Analysis. In *Applications of cognitive work analysis* (pp. 322–353).
- Looker, A. (2002). Editorial : The Skeleton , Race , and Ethnicity. *J Clin Endocrinol Metab*, 87(7), 3047–3050.
- Lubans, D., Richards, J., Hillman, C., Faulkner, G., Beauchamp, M., Nilsson, M., Kelly, P., Smith, J., Raine, L., & Biddle, S. (2016). Physical activity for cognitive and mental health in youth: A systematic review of mechanisms. *Pediatrics*, 138(3).

- Lützhöft, M., Nyce, J. M., & Petersen, E. S. (2010). Epistemology in ethnography: Assessing the quality of knowledge in human factors research. *Theoretical Issues in Ergonomics Science*, 11(6), 532–545.
- Marmaras, N., Poulakakis, G., & Papakostopoulos, V. (1999). Ergonomic design in ancient Greece. *Applied Ergonomics*, 30(4), 361–368.
- Marras, W. S., & Hancock, P. A. (2014). Putting mind and body back together: A human-systems approach to the integration of the physical and cognitive dimensions of task design and operations. *Applied Ergonomics*, 45(1), 55–60.
- Marshall, M. (2014). Researchers-in-residence: a solution to the challenge of evidence-informed improvement? *Primary Health Care Research & Development*, 15(4), 337–338.
- Martindale, R. J. J., Collins, D., & Daubney, J. (2005). Talent development: A guide for practice and research within sport. *Quest*, 57(4), 353–375.
- Martindale, R. J. J., Collins, D., & Abraham, A. (2007). Effective talent development: The elite coach perspective in UK sport. *Journal of Applied Sport Psychology*, 19(2), 187–206.
- Maseko, J., & Surujlal, J. (2011). Retirement planning among South African professional soccer players: A qualitative study of players' perceptions. *African Journal for Physical, Health Education, Recreation and Dance*, 17(2), 157–171.
- May, J., & Govender, J. (1998). Poverty and inequality in South Africa. *Indicator South Africa*, 15, 135–150.
- Maylam, P. (2016). 'Oxford in the bush': the founding (and diminishing) ethos of Rhodes University. *African Historical Review*, 48(1), 21–35.
- Maylam, P. (2017). *South Africa's racial past: The history and historiography of racism, segregation, and apartheid*. Routledge.
- Mayosi, B. M., Flisher, A. J., Lalloo, U. G., Sitas, F., Tollman, S. M., & Bradshaw, D. (2009). The burden of non-communicable diseases in South Africa. *The Lancet*, 374(9693), 934–947.

- McGarry, T. (2009). Applied and theoretical perspectives of performance analysis in sport: Scientific issues and challenges. *International Journal of Performance Analysis in Sport*, 9(1), 128–140.
- McLean, S., Salmon, P. M., Gorman, A. D., Read, G. J. M., & Solomon, C. (2017). What's in a game? A systems approach to enhancing performance analysis in football. *PLoS ONE*, 12(2), 1–15.
- Mettetal, G., & Bryant, D. (1996). Service learning research projects: Empowerment in students, faculty, and communities. *College Teaching*, 44(1), 24–28.
- Miles, R., & Randle, I. (2016). Human Factors and Ergonomics Practice in the Oil and Gas Industry: Contributions to Design and Operations, (Chapter 17). In S. S. and C. Williams (Ed.), *Human factors and ergonomics in practice: Improving system performance and human well-being in the real world*. Boca Raton, FL: CRC Press.
- Miller, A. (2004). A work domain analysis framework for modelling intensive care unit patients. *Cognition, Technology & Work*, 6(4), 207–222.
- Misener, K., & Doherty, A. (2013). Understanding capacity through the processes and outcomes of interorganizational relationships in nonprofit community sport organizations. *Sport Management Review*, 16(2), 135–147.
- Mohamed, E. E., Useh, U., & Mtshali, B. F. (2012). Q-angle, pelvic width, and intercondylar notch width as predictors of knee injuries in women soccer players in South Africa. *African Health Sciences*, 12(2), 174–180.
- Møller, V., & Erstad, I. (2007). Stigma associated with tuberculosis in a time of hiv/ aids: Narratives from the eastern cape, south africa. *South African Review of Sociology*, 38(2), 103–119.
- Moore, T. L., & Ward, K. (2010). Institutionalizing Faculty Engagement through Research, Teaching, and Service at Research Universities. *Michigan Journal of Community Service Learning Fall*, 17(1), 44–58.
- Moray, N. (1995). Ergonomics and the global problems of the twenty-first century. *Ergonomics*, 38(8), 1691–1707.

- Moray, N. (2000). Culture, politics and ergonomics. *Ergonomics*, 43(7), 858–868.
- More, I., & Aye, G. C. (2017). Effect of social infrastructure investment on economic growth and inequality in South Africa: A SEM approach. *International Journal of Economics and Business Research*, 13(2), 95–109.
- Morel, G., Amalberti, R., & Chauvin, C. (2009). How good micro/macro ergonomics may improve resilience, but not necessarily safety. *Safety Science*, 47(2), 285–294.
- Murray-Webster, R., & Simon, P. (2006). Making Sense of Stakeholder Mapping. *PM World Today*, 3(11), 5.
- Myer, G. D., Jayanthi, N., Difiori, J. P., Faigenbaum, A. D., Kiefer, A. W., Logerstedt, D., & Micheli, L. J. (2015). Sport Specialization, Part I: Does Early Sports Specialization Increase Negative Outcomes and Reduce the Opportunity for Success in Young Athletes? *Sports Health*, 7(5), 437–442.
- Myer, G. D., Jayanthi, N., DiFiori, J. P., Faigenbaum, A. D., Kiefer, A. W., Logerstedt, D., & Micheli, L. J. (2016). Sports Specialization, Part II: Alternative Solutions to Early Sport Specialization in Youth Athletes. *Sports Health*, 8(1), 65–73.
- Naikar, N., Hopcroft, R., & Moylan, A. (2005). Work domain analysis: Theoretical concepts and methodology. In *Defence Science and Technology Report*.
- Naikar, N., Lintern, G., & Sanderson, P. (2002). Cognitive Work Analysis for Air Defense Applications in Australia. Naikar, N., Lintern, G., & Sanderson, P. (2002). *Cognitive Work Analysis for Air Defense Applications in Australia. Cognitive Systems Engineering in Military Aviation Environments: Avoiding Cogminutia Fragmentosa*, 3, 225–264.
- Naikar, N., Moylan, A., & Pearce, B. (2006). Analysing activity in complex systems with cognitive work analysis: Concepts, guidelines and case study for control task analysis. *Theoretical Issues in Ergonomics Science*, 7(4), 371–394.

- Nair, Y., & Campbell, C. (2008). Building partnerships to support community-led HIV/AIDS management: A case study from rural South Africa. *African Journal of AIDS Research*, 7(1), 45–53.
- Ndimande-Hlongwa, N. (2010). Nicknames of south african soccer teams and players as symbols of approbation in a multilingual and multicultural country. *South African Journal of African Languages*, 30(1), 88–97.
- Nematswerani, H. E., & Mars, M. (2005). A comparison of the nature and severity of injuries in younger and older professional soccer players. *South African Journal of Sports Medicine*, 17(3), 12–18.
- Neumann, W. P. P., Dixon, S. M. M., & Ekman, M. (2012). Ergonomics action research I: Shifting from hypothesis testing to experiential learning. *Ergonomics*, 55(10), 1127–1139.
- Neumann, W. P. P., & Village, J. (2012). Ergonomics action research II: A framework for integrating HF into work system design. *Ergonomics*, 55(10), 1140–1156.
- Nickerson, R. S. (1992). What does human factors research have to do with environmental management? *Proceedings of the Human Factors Society*, 36, 636–639.
- Nusem, E., Wrigley, C., & Matthews, J. (2017). Developing design capability in nonprofit organizations. *Design Issues*, 33(1), 61–75.
- Ogunniyi, C. (2015). The effects of sport participation on gender relations: Case studies of female footballers in Johannesburg and Cape Town, South Africa. *South African Review of Sociology*, 46(1), 25–46.
- On-Side-Consulting. (2012). *SAFA Technical Master Plan. 011*, 1–85.
- Ottino, J. (2003). Complex systems. *AIChE Journal*, 49(2), 546–552.
- Ottosson, S. (2003). Participation action research - A key to improved knowledge of management. *Technovation*, 23(2), 87–94.
- Ottosson, S., & Björk, E. (2004). Research on dynamic systems - Some considerations. *Technovation*, 24(11), 863–869.

- Ouyang, M., Hong, L., Yu, M. H., & Fei, Q. (2010). STAMP-based analysis on the railway accident and accident spreading: Taking the China-Jiaoji railway accident for example. *Safety Science*, 48(5), 544–555.
- Paphitis, S. A., & Kelland, L. (2016). The university as a site for transformation: Developing civic-minded graduates at south african institutions through an epistemic shift in institutional culture. *Education as Change*, 20(2), 184–203.
- Pariès, J., & Hayward, B. (2016). Human Factors and Ergonomics Practice in Aviation: Assisting Human Performance in Aviation Operations (Chapter 15). In S. S. and C. Williams (Ed.), *Human factors and ergonomics in practice: Improving system performance and human well-being in the real world*. Boca Raton, FL: CRC Press.
- Peacock-Villada, P., DeCelles, J., & Banda, P. S. (2007). Grassroot Soccer resiliency pilot program: Building resiliency through sport-based education in Zambia and South Africa. In *New Directions for Youth Development* (Issue 116, pp. 141–154).
- Pelak, C. F. (2005). Negotiating Gender/Race/Class Constraints in the New South Africa. *International Review for the Sociology of Sport*, 40(1), 53–70.
- Pfister, G. (2015). Assessing the sociology of sport: On women and football. *International Review for the Sociology of Sport*, 50(4–5), 563–569.
- Plant, K. L., & Stanton, N. A. (2013). The explanatory power of Schema Theory: theoretical foundations and future applications in Ergonomics. *Ergonomics*, 56(1), 1–15.
- Po, A. M. Y., & Ho, Y. (2016). Can Service Learning Cultivate Empowering Experiences for Students ? Insight from Empowerment Pedagogy The pre and post service learning survey showed significant improvement in both the intellectual and civil development of students who enrolled in the c. *2nd International Conference on Service-Learning*, 1–2.
- Poonamallee, L. (2009). Building grounded theory in action research through the interplay of subjective ontology and objective epistemology. *Action Research*, 7(1), 69–83.

- Radjiyev, A., Qiu, H., Xiong, S., & Nam, K. H. (2015). Ergonomics and sustainable development in the past two decades (1992-2011): Research trends and how ergonomics can contribute to sustainable development. *Applied Ergonomics*, 46, 67–75.
- Rafferty, L. A., Stanton, N. A., & Walker, G. H. (2013). Great expectations: A thematic analysis of situation awareness in fratricide. *Safety Science*, 56, 63–71.
- Rasmussen, J. (1983). Skills, Rules, and Knowledge; Signals, Signs, and Symbols, and Other Distinctions in Human Performance Models. *IEEE Transactions on Systems, Man and Cybernetics*, 3, 257–266.
- Rasmussen, J. (1993). Commentary: What are we looking for in the black box. *International Journal of Human Factors in Manufacturing*, 3(1), 91–94.
- Rasmussen, J. (1997). Risk management in a dynamic society: A modelling problem. *Safety Science*, 27(2–3), 183–213.
- Rasmussen, J., Pejtersen, A. M., & Goodstein, L. P. (1994). *Cognitive systems engineering*.
- Rasmussen, J., & Svedung, I. (2000). Proactive Risk Management in a Dynamic Society. In *Karlstad: Swedish Rescue Services*.
- Read, G. J. M., Salmon, P. M., Goode, N., & Lenné, M. G. (2018). A sociotechnical design toolkit for bridging the gap between systems-based analyses and system design. *Human Factors and Ergonomics In Manufacturing*, 28(6), 327–341.
- Read, G. J. M., Salmon, P. M., & Lenné, M. G. (2016). When paradigms collide at the road rail interface: evaluation of a sociotechnical systems theory design toolkit for cognitive work analysis. *Ergonomics*, 59(9), 1135–1157.
- Read, G. J. M., Salmon, P. M., Lenné, M. G., & Jenkins, D. P. (2015). Designing a ticket to ride with the Cognitive Work Analysis Design Toolkit. *Ergonomics*, 58(8), 1266–1286.

- Read, G. J. M., Salmon, P. M., Lenné, M. G., & Stanton, N. A. (2015). Designing sociotechnical systems with cognitive work analysis: putting theory back into practice. *Ergonomics*, *58*(5), 822–851.
- Read, G. J. M., Salmon, P. M., Lenné, M. G., & Stanton, N. A. (2016). Walking the line: Understanding pedestrian behaviour and risk at rail level crossings with cognitive work analysis. *Applied Ergonomics*, *53*, 209–227.
- Read, G. J. M., Salmon, P. M., Lenné, M. G., Stanton, N. A., Mulvihill, C. M., & Young, K. L. (2016). Applying the prompt questions from the Cognitive Work Analysis Design Toolkit: a demonstration in rail level crossing design. *Theoretical Issues in Ergonomics Science*, *17*(4), 354–375.
- Reason, J. (1990). The Contribution of Latent Human Failures to the Breakdown of Complex Systems. *Human Factors in Hazardous Situations*, *327*(1241), 475–484.
- Reason, J., Hollnagel, E., & Paries, J. (2006). Revisiting the Swiss cheese model of accidents. *Journal of Clinical Engineering*, *27*(4), 110–115.
- Rebelo, M., Smylie, C., MacIntosh, S., & Lombard, R. (2010). Selected physical attributes of male soccer players: A comparative analysis. *African Journal for Physical, Health Education, Recreation and Dance*, *16*(4), 85–92.
- Reilly, T., & Gilbourne, D. (2003). Science and football: A review of applied research in the football codes. *Journal of Sports Sciences*, *21*(9), 693–705.
- Reiter-Theil, S. (2004). Does empirical research make bioethics more relevant? “The embedded researcher” as a methodological approach. *Medicine, Health Care, and Philosophy*, *7*(1), 17–29.
- Rivilis, I., Van Eerd, D., Cullen, K., Cole, D. C., Irvin, E., Tyson, J., & Mahood, Q. (2008). Effectiveness of participatory ergonomic interventions on health outcomes: A systematic review. *Applied Ergonomics*, *39*(3), 342–358.
- Roberts, B. W., Kuncel, N. R., Shiner, R., Caspi, A., & Goldberg, L. R. (2007). The power of personality: The comparative validity of personality

traits, socioeconomic status, and cognitive ability for predicting important life outcomes. *Perspectives on Psychological Science*, 2(4), 313-345.

Rongen, F., McKenna, J., Cobley, S., & Till, K. (2018). Are youth sport talent identification and development systems necessary and healthy? *Sports Medicine - Open*, 4(1), 2–5.

Roodt, M. J. (2005). Roodt, M. J. (2005). Rhodes University From Apartheid Vastrap to African Swing. *African Sociological Review*, 9(1), 234–239.

Rosso, E., & McGrath, R. (2017). Community engagement and sport? Building capacity to increase opportunities for community-based sport and physical activity. *Annals of Leisure Research*, 20(3), 349–367.

Rowley, H. (2014). Going beyond procedure: Engaging with the ethical complexities of being an embedded researcher. *Management in Education*, 28(1), 19–24.

Rutti, R. M., LaBonte, J., Helms, M. M., Hervani, A. A., & Sarkarat, S. (2016). The service learning projects: stakeholder benefits and potential class topics. *Education and Training*, 58(4), 422–438.

Ryan, A. B. (2006). Post-positivist approaches to research. In *Researching and writing your thesis: A guide for postgraduate students*.

Ryan, B. (2015). *The efficacy of a community based eccentric hamstring strengthening program in peri-urban black South African soccer players*.

Ryan, B. & Todd, A. I. (In press, 2021). Chasing significance in sports science research – a human factors and ergonomics approach to social innovation. In, *Challenging the 'Apartheids' of Knowledge in Higher Education through Social Innovation*.

Saavedra, M. (2003). Football feminine – development of the African game: Senegal, Nigeria and South Africa. *Soccer & Society*, 4(2–3), 225–253.

SAFA. (2017). *SAFA competitions uniform rules*. August, 1–30.

SAFA. (2018a). *Draft LFA Constitution - 25 Sep 2018*.

SAFA. (2018b). *South African Football Association Activity Report*. 105–117.

- Sallis, J. F., Owen, N., & Fisher, E. B. (2008). Ecological models of health behavior. In *Health Behavior and Health Education: Theory, Research, and Practice* (pp. 465–485).
- Salmon, P. M., Cornelissen, M., & Trotter, M. J. (2012). Systems-based accident analysis methods: A comparison of Accimap, HFACS, and STAMP. *Safety Science*, *50*(4), 1158–1170.
- Salmon, P. M., Dallat, C., & Clacy, A. (2017). It ' s not all about the bike : distributed situation awareness and teamwork in elite women ' s cycling teams. *Contemp. Ergon*, 240–248.
- Salmon, P. M., Goode, N., Archer, F., Spencer, C., McArdle, D., & McClure, R. J. (2014). A systems approach to examining disaster response: Using Accimap to describe the factors influencing bushfire response. *Safety Science*, *70*, 114–122.
- Salmon, P. M., Lenné, M. G., Read, G. J. M., Mulvihill, C. M., Cornelissen, M., Walker, G. H., Young, K. L., Stevens, N., & Stanton, N. A. (2016). More than meets the eye: Using cognitive work analysis to identify design requirements for future rail level crossing systems. *Applied Ergonomics*, *53*, 312–322.
- Salmon, P. M., McClure, R., & Stanton, N. A. (2012). Road transport in drift? Applying contemporary systems thinking to road safety. *Safety Science*, *50*(9), 1829–1838.
- Salmon, P. M., & McLean, S. (2020). Complexity in the beautiful game: implications for football research and practice. *Science and Medicine in Football*, *4*(2), 162–167.
- Salmon, P. M., & Read, G. J. M. (2019). Many model thinking in systems ergonomics: a case study in road safety. *Ergonomics*, *62*(5), 612–628.
- Salmon, P. M., Walker, G. H., Read, G. J. M., Goode, N., Stanton, A., & Stanton, N. A. (2017). Fitting methods to paradigms: are ergonomics methods fit for systems thinking? *Ergonomics*, *60*(2), 1–12.

- Sanderson, P. M. (2003). Cognitive Work Analysis across the system life-cycle: Achievements, challenges, and prospects in aviation. *Aviation Resource Management*, 3, 73–85.
- Sarmiento, H., Anguera, M. T., Pereira, A., & Araújo, D. (2018). Talent Identification and Development in Male Football: A Systematic Review. *Sports Medicine*, 48(4), 907–931.
- Schatzberg, M. G. (2018). Soccer , Science , and Sorcery : Causation and African Football. *Africa Spectrum*, 41(3), 351–369.
- Scott, K. E., & Graham, J. A. (2015). Service-Learning: Implications for Empathy and Community Engagement in Elementary School Children. *Journal of Experiential Education*, 38(4), 354–372.
- Shappell, S. A., & Wiegmann, D. A. (2003). *Reshaping the way we look at general aviation accidents using the human factors analysis and classification system*.
- Shappell, S. a, & Wiegmann, D. A. (2000). The Human Factors Analysis and Classification System – HFACS. *Security*, 19.
- Sharpe, E. K. (2006). Resources at the grassroots of recreation: Organizational capacity and quality of experience in a community sport organization. *Leisure Sciences*, 28(4), 385–401.
- Shepherd, A. (2002). *Hierarchical task analysis*. CRC Press.
- Shorrock, S. T. (2019). Safety research and safety practice: Islands in a common sea. In *Safety Science Research: Evolution, Challenges and New Directions* (p. 223).
- Shorrock, Steven T., & Williams, C. A. (2016a). Human factors and ergonomics in practice: Improving system performance and human well-being in the real world. In *Human Factors and Ergonomics in Practice*. CRC Press.
- Shorrock, Steven T., & Williams, C. A. (2016b). Human factors and ergonomics methods in practice: three fundamental constraints. *Theoretical Issues in Ergonomics Science*, 17(5–6), 468–482.

- Siemieniuch, C. E., & Sinclair, M. A. (2006). Systems integration. *Applied Ergonomics*, 37(1), 91–110.
- Singleton, W. T. (1967). Ergonomics in systems design. *Ergonomics*, 10(5), 541–548.
- Skyttner, L. (2005). *General Systems* (2nd ed.). World Scientific Publishing Co.
- Smith, M. J., & Carayon-Sainfort, P. (1989). A balance theory of job design for stress reduction. *International Journal of Industrial Ergonomics*, 4(1), 67–79.
- Song, Y. (2012). *Applying System-Theoretic Accident Model and Processes (STAMP) to Hazard Analysis*.
- Soska, T. M., Sullivan-Cosetti, M., & Pasupuleti, S. (2010). Service learning: Community engagement and partnership for integrating teaching, research, and service. *Journal of Community Practice*, 18(2), 139–147.
- Sparks, M., Coetzee, B., & Gabbett, T. J. (2016). Variations in high-intensity running and fatigue during semi-professional soccer matches. *International Journal of Performance Analysis in Sport*, 16(1), 122–132.
- Stander, F., De Beer, L., & Stander, A. (2016). Identification with team as a predictor of buying behaviours amongst South African Premier Soccer League (PSL) fans. *SA Journal of Industrial Psychology*, 42(1), 1–17.
- Stansinopoulos, P., Smith, M. H., Hargroves, K., & Desha, C. (2013). *Whole system design: An integrated approach to sustainable engineering*. Routledge.
- Stanton, N. A. (1996). Human factors in Nuclear safety. In *Safety Science* (Vol. 24, Issue 3). CRC Press. [https://doi.org/10.1016/s0925-7535\(97\)81484-1](https://doi.org/10.1016/s0925-7535(97)81484-1)
- Stanton, N. A. (2006). Hierarchical task analysis: Developments, applications, and extensions. *Applied Ergonomics*, 37(1), 55–79.
- Stanton, N. A. (2013). *Human Factors Methods: A Practical Guide for Engineering and Design*. Ashgate Publishing, Ltd..

Stanton, N. A. (2014). Representing distributed cognition in complex systems: How a submarine returns to periscope depth. *Ergonomics*, *57*(3), 403–418.

Stanton, N. A., & Harvey, C. (2017). Beyond human error taxonomies in assessment of risk in sociotechnical systems: a new paradigm with the EAST 'broken-links' approach. *Ergonomics*, *60*(2), 221–233.

Stanton, N. A., Hedge, A., Brookhuis, K., Salas, E., & Hendrick, H. W. (2005). *Handbook of human factors and ergonomics methods*. CRC Press.

Stanton, N. A., Plant, K. L., Revell, K. M. A., Griffin, T. G. C., Moffat, S., & Stanton, M. (2019). Distributed cognition in aviation operations: a gate-to-gate study with implications for distributed crewing. *Ergonomics*, *62*(2), 138–155.

Stanton, N. A., Roberts, A. P. J., & Fay, D. T. (2017). Up periscope: understanding submarine command and control teamwork during a simulated return to periscope depth. *Cognition, Technology and Work*, *19*(2–3), 399–417.

Starzak, D. E., Konkol, K. F., & McKune, A. J. (2016). Twelve weeks of soccer-specific training: effects on mucosal immunity, salivary alpha-amylase and body composition in male African youths. *Sport Sciences for Health*, *12*(2), 269–276.

Steinbrink, M. (2010). The Role of Amateur Football in Circular Migration Systems in South Africa. *Africa Spectrum*, *45*(2), 3–14.

Surujlal, J., & Nguyen, S. (2009). Sources of stress in South African soccer coaches. *African Journal for Physical, Health Education, Recreation and Dance*, *15*(4), 113–124.

Surujlal, J., & Nguyen, S. (2011). Motives influencing soccer coaching: An empirical study of professional soccer coaches in South Africa. *African Journal for Physical, Health Education, Recreation and Dance*, *17*(2), 286–296.

- Svedung, I., & Rasmussen, J. (2002). Graphic representation of accident scenarios : mapping system structure and the causation of accidents. *Safety Science*, 40, 397–417.
- Svensson, P., & Levine, J. (2017). Rethinking Sport for Development and Peace: the Capability Approach. *Sport in Society*, 20(7), 905–923.
- Swart, K., Bob, U., Knott, B., & Salie, M. (2011). A sport and sociocultural legacy beyond 2010: A case study of the Football Foundation of South Africa. *Development Southern Africa*, 28(3), 415–428.
- Thatcher, A., Guibourdenche, J., & Cahour, B. (2019). Sustainable system-of-systems and francophone activity-centered approaches in ergonomics: Converging and diverging lines of dialogue. *Psychologie Francaise*, 64(2), 159–177.
- Thatcher, A., Nayak, R., & Waterson, P. (2020). Human factors and ergonomics systems-based tools for understanding and addressing global problems of the twenty-first century. *Ergonomics*, 63(3), 367–387.
- Thatcher, A., Waterson, P., Todd, A., & Moray, N. (2018). State of Science: ergonomics and global issues. *Ergonomics*, 61(2), 197–213.
- Thatcher, A., & Yeow, P. (2016). A sustainable system of systems approach: a new HFE paradigm. *Ergonomics*, 59(2), 167–178.
- Theberge, N., & Neumann, W. P. (2010). Doing “organizational work”: Expanding the conception of professional practice in ergonomics. *Applied Ergonomics*, 42(1), 76–84.
- Toohey, K., MacMahon, C., Weissensteiner, J., Thomson, A., Auld, C., Beaton, A., Burke, M., & Woolcock, G. (2018). Using transdisciplinary research to examine talent identification and development in sport. *Sport in Society*, 21(2), 356–375.
- Tucker, R., & Collins, M. (2012). What makes champions? a review of the relative contribution of genes and training to sporting success. *British Journal of Sports Medicine*, 46(8), 555–561.

- Tucker, R., Santos-Concejero, J., & Collins, M. (2013). The genetic basis for elite running performance. *British Journal of Sports Medicine*, 47(9), 545–549.
- Underwood, P., & Waterson, P. (2013). *Accident Analysis Models and Methods : Guidance for Safety Professionals*. May, 28 pp.
- Underwood, P., & Waterson, P. (2014). Systems thinking, the Swiss Cheese Model and accident analysis: A comparative systemic analysis of the Grayrigg train derailment using the ATSB, AcciMap and STAMP models. *Accident Analysis and Prevention*, 68, 75–94.
- Uys, M., Bassett, S., Draper, C. E., Micklesfield, L., Monyeki, A., de Villiers, A., & Lambert, E. V. H. 2016 W. G. (2016). Results From South Africa's 2016 Report Card on Physical Activity for Children and Youth. *Journal of Physical Activity and Health*, 13(2), 265–273.
- Van Riet, M. Der, & Boettiger, M. (2009). Shifting research dynamics: Addressing power and maximising participation through participatory research techniques in participatory research. *South African Journal of Psychology*, 39(1), 1–18.
- Vicente, K. J. (1997). COMMENTARY Heeding the Legacy of Meister, Brunswik, & Gibson: Toward a Broader View of Human Factors Research. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 39(2), 323–328.
- Vicente, K. J. (1999). *Cognitive work analysis: Toward safe, productive, and healthy computer-based work*. CRC Press.
- Vicente, K. J., & Christoffersen, K. (2006). The walkerton E. Coli outbreak: A test of rasmussen's framework for risk management in a dynamic society. *Theoretical Issues in Ergonomics Science*, 7(2), 93–112.
- Village, J., Greig, M., Salustri, F., Zolfaghari, S., & Neumann, W. P. (2014). An ergonomics action research demonstration: integrating human factors into assembly design processes. *Ergonomics*, 57(10), 1574–1589.

- Vindrola-Padros, C., Pape, T., Utley, M., & Fulop, N. J. (2017). The role of embedded research in quality improvement: A narrative review. *BMJ Quality and Safety*, 26(1), 70–80.
- Volinn, E. (1999). Do workplace interventions prevent low-back disorders? If so, why?: A methodologic commentary. *Ergonomics*, 42(1), 258–272.
- Walker, G. H., Gibson, H., Stanton, N. A., Baber, C., Salmon, P. M., & Green, D. (2006). Event analysis of systemic teamwork (EAST): A novel integration of ergonomics methods to analyse C4i activity. *Ergonomics*, 49(12–13), 1345–1369.
- Walker, G. H., Stanton, N. A., Baber, C., Wells, L., Gibson, H., Salmon, P. M., & Jenkins, D. (2010). From ethnography to the east method: A tractable approach for representing distributed cognition in air traffic control. *Ergonomics*, 53(2), 184–197.
- Walker, G. H., Stanton, N. a., Salmon, P. M., & Jenkins, D. P. (2008). A review of sociotechnical systems theory: A classic concept for new command and control paradigms. *Theoretical Issues in Ergonomics Science*, 9(6), 479–499.
- Walker, G. H., Stanton, N. A., Salmon, P. M., Jenkins, D. P., & Rafferty, L. (2010). Translating concepts of complexity to the field of ergonomics. *Ergonomics*, 53(10), 1175–1186.
- Walpole, M., & Wilder, L. (2008). Disentangling the links between conservation and poverty reduction in practice. *Oryx*, 42(4), 539–547.
- Waterson, P. (2009). A critical review of the systems approach within patient safety research. *Ergonomics*, 52(10), 1185–1195.
- Waterson, P., Robertson, M. M., Cooke, N. J., Militello, L., Roth, E., & Stanton, N. A. (2015). Defining the methodological challenges and opportunities for an effective science of sociotechnical systems and safety. *Ergonomics*, 58(4), 565–599.
- Waterson, P., Jenkins, D. P., Salmon, P. M., & Underwood, P. (2017). ‘Remixing Rasmussen’: The evolution of Accimaps within systemic accident analysis. *Applied Ergonomics*, 59, 483–503.

- Wendel, M. L., Burdine, J. N., McLeroy, K. R., Alaniz, A., Norton, B., & Felix, M. R. (2009). Community capacity: theory and application. In *Emerging theories in health promotion practice and research*, (pp. 277–302).
- Westaway, A. (2012). Rural poverty in the Eastern Cape Province: Legacy of apartheid or consequence of contemporary segregationism? *Development Southern Africa*, 29(1), 115–125.
- Whitley, M. A., Hayden, L. A., & Gould, D. (2013). Growing up in the Kayamandi Township: I. The role of sport in helping young people overcome challenges within their community Department of Exercise Science, Health Studies, Physical Education, & Sport Management, Adelphi University, Garden City, *Qualitative Research in Sport, Exercise and Health*, 5(3), 1–48.
- Wickens, C. D., Gordon, S. E., & Liu, Y. (1998). *An introduction to human factors engineering*.
- Wicker, P., & Breuer, C. (2011). Scarcity of resources in German non-profit sport clubs. *Sport Management Review*, 14(2), 188–201.
- Wicker, P., Breuer, C., & Pawlowski, T. (2009). Promoting Sport for All to Age-specific Target Groups: the Impact of Sport Infrastructure. *European Sport Management Quarterly*, 9(2), 103–118.
- Wilkin, P. (2010). The ideology of ergonomics. *Theoretical Issues in Ergonomics Science*, 11(3), 230–244.
- Wilkinson, J. (2016). Human and Organisational Factors in Regulation: Views from a Former Regulator (Chapter 20). In S. S. and C. Williams (Ed.), *Human factors and ergonomics in practice: Improving system performance and human well-being in the real world*. Boca Raton, FL: CRC Press.
- Williams, A. M., & Reilly, T. (2000). Talent identification and development in soccer. *Journal of Sports Sciences*, 18(9), 657–667.
- Willis, C. D., Saul, J., Bevan, H., Scheirer, M. A., Best, A., Greenhalgh, T., Mannion, R., Cornelissen, E., Howland, D., Jenkins, E., & Bitz, J. (2016). Sustaining organizational culture change in health systems. *Journal of Health, Organisation and Management*, 30(1), 2–30.

- Wilson, J. R. (1991). Participation—A framework and a foundation for ergonomics? *Journal of Occupational Psychology*, 64(1), 67–80.
- Wilson, J. R. (1994). Devolving ergonomics: the key to ergonomics management programmes. *Ergonomics*, 37(4), 579–594.
- Wilson, J. R. (1995). Ergonomics and participation. *Evaluation of Human Work: A Practical Ergonomics Methodology*, 2, 1071–1096.
- Wilson, J. R. (2000). Fundamentals of ergonomics in theory and practice. *Applied Ergonomics*, 31(6), 557–567.
- Wilson, J. R. (2012). Fundamentals of systems ergonomics. *Work*, 41(1), 3861–3868.
- Wilson, J. R. (2014). Fundamentals of systems ergonomics/human factors. *Applied Ergonomics*, 45(1), 5–13.
- Wisner, A. (1985). Ergonomics in industrially developing countries. *Ergonomics*, 28(8), 1213–1224.
- Wisner, A. (1995). Understanding problem building: ergonomic work analysis. *Ergonomics*, 38(3), 595–605.
- Wong, S. (2009). Tales from the frontline: The experiences of early childhood practitioners working with an “embedded” research team. *Evaluation and Program Planning*, 32(2), 99–108.
- Wreathall, J. (2006). *Developing Models for Measuring Resilience* (pp. 1–7). John Wreathall & Co., Inc.
- Young, L. (2006). Participatory Action Research (PAR): A research strategy for nursing? *Western Journal of Nursing Research*, 28(5), 499–504.
- Yu, N., Chen, F. C., Ota, S., Jorde, L. B., Pamilo, P., Patthy, L., & Li, W. H. (2002). Larger genetic differences within african than between africans and eurasians. *Genetics*, 161(1), 269–274.
- Zalk, D. M. (2001). Grassroots ergonomics: Initiating an ergonomics program utilizing participatory techniques. *Annals of Occupational Hygiene*, 45(4), 283–289. h

Zeederberg, C., Leach, L., Lambert, E. V., Noakes, T. D., Dennis, S. C., & Hawley, J. A. (1996). The effect of carbohydrate ingestion on the motor skill proficiency of soccer players. *International Journal of Sport Nutrition and Exercise Metabolism*, 6(4), 348–355.

Zink, K. J. (2014). Designing sustainable work systems: The need for a systems approach. *Applied Ergonomics*, 45(1), 126–132.

Zuber-skerritt, O. (2015). Participatory Action Learning and Action Research (PALAR) for Community Engagement: A Theoretical Framework. *Educational Research for Social Change*, 4(1), 5–25.

LIST OF APPENDICES

1. Cognitive Work Analysis Guide
2. Letter to Participants
3. Informed Consent
4. Participant Background Questionnaire
5. Workshop Review Survey
6. Work as Prescribed – Work Domain Analysis
7. Work as Disclosed – Work Domain Analysis
8. Work as Disclosed – Contextual Activity Template
9. Work as Disclosed – Strategies Analysis
10. List of Direct Quotes
11. Workshop Review Questionnaire Responses

Appendix 1: Cognitive Work Analysis Guide

Cognitive Work Analysis (CWA) is a human factors and ergonomics systems analysis tool. It is a structured framework for analysing and designing complex socio-technical systems. “Complex” in that such systems are dynamic, uncertain and made up of numerous interconnected parts—“Sociotechnical” in that they contain both human and technical components. CWA has been employed through a vast number of domains and contexts, to significant effect. This is due to the objective nature of the analysis. The exact nature of any system is best understood by those who act within it. These Subject Matter Experts (SME) are best placed to develop models of their systems, as they have a unique insight into emergent characteristics and components that may otherwise go unnoticed. The role of the researcher in applying CWA is, therefore, to act as a facilitator, to provide a platform for SMEs to develop the conceptual model of the system of interest. As a result, CWA is formative and looks to how things are currently done, and how they could potentially be done within a system.

Table I: Cognitive Work Analysis (CWA) relevant literature and application domains

<u>Application Area</u>	<u>Study</u>
System modelling	Hajdukiewicz (1998)
System design	Bisantz <i>et al.</i> (2003) Read <i>et al.</i> (2016) Salmon <i>et al.</i> (2016)
Training needs analysis	Jenkins <i>et al.</i> (2008) Naikar and Sanderson (1999) Salmon <i>et al.</i> (2012)
Training program evaluation & design	Naikar and Sanderson (1999)

Interface design and evaluation	Vicente (1999)
Information requirements specification	Ahlstrom (2005)
Tender evaluation	Naikar and Sanderson (2001)
Team design	Naikar, Pearce, Drum & Sanderson (2003)
Error management strategy design	Naikar and Saunders (2003)
Multi-road user evaluation	Cornelissen <i>et al.</i> (2013)
Football	McLean <i>et al.</i> (2017)
Aviation	Naikar & Sanderson (2001)
Road transport	Birrell, Young, Stanton & Jenkins (2008) Cornelissen <i>et al.</i> (2014)
Health care	Miller (2004) Jiancaro <i>et al.</i> (2014)
Air traffic control	Ahlstrom (2005)

The primary outcomes of CWA are the identification of constraints and affordances. A “Constraint” is something that limits or controls what you do, while “Affordances” refer to the opportunities available within the systems, based on the people and technical components within them. CWA, therefore, aims to consider different sets of constraints and affordances influencing the way that work can be performed. An additional concept that is very important within systems theory literature is that of resilience. System states are continually changing as new components and events emerge. The ability of the system to withstand disruption, and still achieve its functional purpose, is its resilience. Resilience is ensuring redundant protective mechanisms, or opportunities to perform work in different ways, to meet the same ends. Constraints and affordances are therefore crucial in analysing the resilience of a system, and understanding the impact of system design overall functional performance (Rasmussen, 1997).

A system is constrained by several factors, which limit the space of possibilities, or affordances of agents within the system. CWA aims to identify and engage with the space of possibilities, for how work can be achieved while considering the constraints that infringe on the freedom for resolution through subjective preference. This allows for effective system modelling and analysis, which in turn, inform system redesign to improve its resilience. The CWA utilizes five stages to identify constraints and affordances at different levels of the system. The vast complexity of sociotechnical systems means that there are influences from a vast number of different domains and areas of study.

CWA aims to integrate these different areas of expertise to gain insight into the broad system. This allows for the development of more sustainable systems and more efficient use of resources. The broad nature of the complex sociotechnical system is again shown by Rasmussen (1997). Within this risk management framework, we can see there are a vast number of layers from government policy, regulators, company, management, staff and work, interacting within a unique context, informed by various research disciplines. CWA doesn't aim to presume expertise on behalf of other research disciplines, but rather highlight the importance of each, as components within a broader picture.

The complexity associated with human-related systems is highly challenging. Therefore, an initial consideration for researchers is the definition of the system and the boundaries of analysis. Boundaries are informed by many different aspects, such as resources, time, and access to relevant information. During the initial stages of exploratory research, it is often difficult to gain access to systems, across an entire organization or context. Therefore, depending on the nature of the analysis, it is vital to place definitive boundaries on the system you aim to conceptualize.

This relates significantly to the interaction with SMEs. Researchers must define the SMEs involved, acknowledge how these groups may interact, while also considering the general constraint of research study resources. The system under review will, therefore, most often be a subsystem, within a broader context. This broader context must be acknowledged, but maybe

beyond the scope of the study. The true nature of CWA lies in transparency. Throughout the process, analysts must define the terms they use, the SMEs involved and their perspective, the scope of analysis to allow for those independent of the research to gain insight into its efficacy.

The 5 Phases of CWA

CWA starts by considering how the system might reasonably perform (formative modelling), rather than focusing on how the system should perform (normative modelling) or how the system currently performs (descriptive modelling). CWA has been described as a mature analytical framework which can more extensively address system design issues than other methods from cognitive engineering (Lintern 2008). It has strong roots in systems theory (Fidel and Pejtersen 2005; Sanderson 2003b). For clarity, a distinction will be made between analysis and design (Read, 2015), although in practice, these activities are closely associated and mutually informing (Vicente 1999). The use of the term 'analysis' is intended to refer to the process of understanding the constraints of a complex system using the tools of the CWA framework. The analysis outputs include representations such as the abstraction hierarchy (AH), the decision ladder and contextual activity template (Read, 2015).

According to Naikar and Lintern (2002), the framework supports revolutionary rather than evolutionary design. This is reinforced by Vicente (1999), who recommends CWA for systems that need to support performance in the face of unanticipated variability and systems which have no precedent. The framework leads the analyst to consider the environment within which the task takes place, and the effects of constraints imposed on the system's ability to perform its purpose (Birrell, 2012). The constraints associated with each step are listed below. As with all guidelines related to CWA, these are merely to provide a framework for the researcher.

1. Work Domain Analysis (WDA)

- Describe the system and its constraints, based on its purpose, its intentions, its functions, and its components.

2. Control Task Analysis (ConTA)

- Model activities required to achieve functions, including the decision-making processes

3. Strategies Analysis (StrA)

- How these activities are and can be achieved and how that constrains behaviour

4. Social Organization and Cooperation Analysis (SOCA)

- Who does or could do them (Man or technology)? Allocation of tasks constraints

5. Worker Competency Analysis (WCA)

- Cognitive Skills required and the associated constraints to performance

As described above, each stage of the CWA process allows for the identification of different constraints and affordances within the system. These constraints may involve laws of physics, regulations, financial caps, organizational structures, or human cognitive limitations. By highlighting constraints in a systematic manner, the results of the five phases show how options for action become progressively narrowed within a system (Vicente, 1999). Another way to view these phases is by considering the set of questions and concerns they address, as outlined by Kilgore, St-Cyr, and Jamieson (2008). To begin, these concerns relate to the overall purpose of a system (Why?) and progressively narrow to the systemwide tasks to be performed (What?), the strategies within the organization to be invoked (How?), the roles and responsibilities for various “actors,” be they human or machine, to fulfil (By whom?), and finally, the competencies necessary for an individual working within the system to utilize (By what means?) (Jiancaro *et al.*, 2014).

Within the WDA, fundamental constraints (those created by the functional purpose) define the nature of the system and the overall values associated with it. To meet these aims, certain functions need to be performed that can be broken into activities that require certain components or physical objects.

The ConTA aims to analyse how activities are performed, and the decisions that are made that inform the various aspects of the system. The StrA then engages with the different options or possibilities available for each activity, while the SOCA then investigates the distribution of tasks across agents. Finally, the WCA analyses the cognitive skills required to perform the tasks outlined in the previous steps. It is vital to note that the systems analysis does not look at individual competency. It instead focuses on the job requirements of each task or activity and the resources available. WCA identifies the skills required, not the current skills of individuals. Engaging with individual competency requires different skills to those possessed by the Human Factors expert. If such an investigation is needed, the researcher is therefore well placed to engage with experts to join the investigation.

The steps of the CWA provide information that inform the following stages. For example, the function identified within the WDA is utilized within the ConTA. The activities associated with these functions are then unpacked within the StrA, and then allocated within the SOCA. This demonstrates the formative nature of the analysis, with SMEs generating the conceptual model of the system, under the guidance of the researcher. Each system is unique, with individual concepts and components. For effective analysis, it is imperative that the researcher accurately define their process at each step to ensure clarity and sufficient justification. The relationship of each stage, a summary of how each is represented, and fundamentally, how information is gathered, is adequately demonstrated by Naiker (2006). Each phase has specific data acquisition methods which inform the development of the conceptual model. Not all tools are necessary, and so researchers must justify the exclusion and inclusion of each data collection method. This is informed by stakeholder interactions and general access to information. Based on these techniques, each phase is represented through a specific framework.

Work Domain Analysis (WDA)

Hajdukiewicz and Vicente (2004) are keen to point out that WDA does not explicitly deal with any particular worker, automation, event, task, goal or

interface. Via a hierarchy, WDA captures the relationships between the physical objects and the system's overall purpose. The first stage of this process is to construct an abstraction hierarchy (AH) of the domain. The AH represents the system domain at several levels; at the highest level, the AH captures the system's purpose for existence; at the lowest level, the AH captures the physical objects within the system. The bottom level of the AH shows each of the physical objects within the domain; The level above this describes the functions that each of the objects can afford, independent of the overall system purpose; in many cases, an object may perform a number of functions, in the same way, a particular function may be afforded by a number of objects.

The purpose-related functions in the middle of the AH are the functions required to perform the purposes of the system. Each of these levels can be linked by means-ends relationships using the why–what–how relationship. Any node in the AH can be taken to answer that question of 'what' it does. The node is then linked to all of the nodes in the level directly above to answer the question 'why' it is needed. It is then linked to all of the nodes in the level directly below that to answer the question 'how' this can be achieved.

This method is derived from Rasmussen's abstraction decomposition hierarchy, which describes the work domain along two dimensions: part-whole and means-ends. The part-whole decomposition looks, for example, at the body from cell to the whole body. In the means-end abstraction, the same human body system can be described at different levels (e.g., as purposes, balances, processes, physiology, and anatomy). Requirements for proper system functioning at one level appear as constraints on lower levels. For example, the body's goal of maintaining adequate tissue oxygen (a purpose) acts as a constraint on circulation and oxygenation processes.

WDA identifies the constraints on workers' behaviour that are imposed by the purposive and physical context, or problem space, in which workers operate. The abstraction decomposition space, which is the main modelling tool for WDA, structures the problem space of workers along two orthogonal dimensions—the abstraction dimension or hierarchy and the decomposition

dimension or hierarchy (Jenkins, 2008). It demonstrates the overall concept of systems theory, that of a system of systems. This links to the concept of analysis boundaries as it is important to appreciate and identify how the various aspects of the system relate to each other. The WDA this deconstructs the system from a stakeholder independent view, to model the system of interest.

Control Task Analysis (ConTA)

The ConTA is used to describe and analyse the tasks that are undertaken to achieve the purposes, priorities and functions of a particular work domain (Naikar, Moylan & Pearce, 2006). There are two strategies that are usually employed at this stage, namely; Rasmussen's decision ladder (Rasmussen, 1976; cited in Vicente, 1999) or Naikar *et al.*'s (2006) Contextual Activity Template (CAT). The Decision ladder describes the decision-making process for specific tasks along with short cuts made by users with differing levels of expertise. The CAT then maps functions and affordances across different contexts and locations in terms of where they are currently undertaken and where they could potentially be performed.

Rasmussen's decision ladder describes how the decisions of actors within the decisions can be mapped, with different modelling tools used for different aspects. For example, active decisions are depicted as square boxes while circles note the current state of the system informing the decision. To assist practitioners in completing this model, Rasmussen described the different prompts that are useful to the modelling process. While they take an error-driven focus due to their historical application area, these are useful in describing how actors make a decision and what constraints or pressures they are placed. It also provides scope to identify how experts skip steps, and how a lack of expertise may compromise system performance.

The main purpose of the ConTA, is to decompose the system activities into control tasks for the various response situations and processes (Miller and Vicente 2001, Jamieson *et al.* 2007). Capturing these constraints is paramount to understanding the team decision-making process (Gonzalez

2004 & Humphrey, 2011). Naikar *et al.* (2005) describe the contextual activity template for use in this phase of the CWA. This template is one way of representing activity in work systems that are characterised by both work situations and work functions. According to Naikar *et al.* (2005), the work situations (situations decomposed by schedules or location) are shown along the horizontal axis and the work functions (activities characterised by its content independent of its temporal or special characteristics; Rasmussen *et al.* 1994) are shown along the vertical axis of the contextual activity template. The dashed boxes indicate in which situations the work functions can occur, whereas the circles and whiskers indicate where the work functions typically occur (Jenkins, 2008). The work functions captured in this diagram are typically similar to the purpose-related functions in the WDA. The boxes in the decision ladder template represent information-processing activities, whereas the ovals represent the states of knowledge that are the results or outputs of those activities. The arrows in the centre of the decision ladder indicate shortcuts from one part of the decision ladder to another.

The application of the ConTA leads the analyst to consider for the first time known recurring activities within the domain. Here, these typical activities are considered against specific situations and further system constraints are discovered. Thus, ConTA identifies the constraints on workers' behaviour that are imposed by the activity that is necessary in a work domain for achieving the purposes, values and priorities, and functions of a work domain with a given set of physical resources.

Strategies Analysis (StrA)

Within CWA a strategy is defined more precisely than in common speech. Rasmussen *et al.* (1994) described a strategy as an idealised category of cognitive processes that (1) share important characteristics (mental model, mode of interpreting evidence, tactical rules), (2) use different resource profiles of an actor and (3) support a stage in decision making. Highlighting the latter property, in particular, Vicente (1999) described a strategy as 'a category of cognitive task procedures that transforms an initial state of knowledge into a final state of knowledge' (p. 9).

The StrA stage is used to identify all of the different strategies that can be used to achieve control tasks. This typically takes the form of information flow maps, or otherwise known as the Strategies analysis diagram (Cornelissen *et al.*, 2013). According to Rasmussen, one of the developers of CWA, Strategies Analysis should (1) identify the different factors that may influence the range of possible strategies, (2) describe strategies as 'generic' categories of cognitive processes, (3) identify the criteria used to select one category of cognitive processes over other possibilities and (4) identify the cues that prompt the selection or change in strategy (Rasmussen 1986, 1993, Rasmussen *et al.* 1990, 1994).

Rasmussen *et al.* (1990) asked whether we can formulate 'generic' classes of strategies and strategy-selection factors that can be effectively applied across a wide range of systems. It may be impossible to arrive at descriptions of strategies as truly 'generic' categories of cognitive processes that are relevant across all domains. Similarly, even if the categories of cognitive processes identified were to capture all possible strategies, including those not yet observed, it would be impossible to prove that all had been captured. As various researchers have noted, one reason that Strategies Analysis is seldom used may be the lack of a satisfactory method for performing it that is well-integrated with the other phases of CWA (Vicente, 1999, Naikar 2006, Kilgore *et al.* 2009, Cornelissen *et al.* 2012).

A formative Strategies Analysis method should help an investigator identify strategies that might be selected under certain conditions and assess how effective those strategies might be. This can be done only by understanding the range of approaches possible and by identifying features of the work system that shape strategy selection and intervention outcomes. Whether a strategy is successful depends on the match between the strategy, the task, the worker and the situation (Rasmussen *et al.* 1990, Can˜as *et al.* 2003, Peters 2005, Naikar 2006, Burns *et al.* 2009).

Various authors have advised that a formative Strategies Analysis method should deliver the following four kinds of information (Rasmussen 1981, Rasmussen *et al.* 1994, Vicente 1999, Naikar 2006): (1) behaviour-shaping

constraints that determine the strategies that could be employed in a work situation, not just the strategies that are employed (generalised constraints), (2) a summary of different types of strategies, described in terms of basic characteristics, which cover a bounded but infinite range of possible action sequences (categories of strategies), (3) criteria used by workers to evaluate and select a strategy (strategy-selection criteria) and (4) factors, cues or prompts shaping workers' decisions on when to change strategies (strategy-change prompts). We will now describe existing Strategies Analysis methods and discuss how they address these four kinds of information.

These are the same criteria for grouping strategies into more generalisable categories of strategies that Rasmussen *et al.* (1994) used when inferring more generalised categories of cognitive processes for certain task types (e.g. situation analysis and diagnosis tasks). The categories of strategies identified are (1) avoidance strategies, (2) intuitive strategies, (3) arbitrary-choice strategies, (4) imitation strategies, (5) option-based strategies, (6) cue-based strategies, (7) compliance strategies and (8) analytical reasoning strategies. The general framework for the strategy's analysis stage is credited to Cornelissen (2013). As discussed, within sociotechnical systems, there are typically a large number of strategies. It is therefore important for researchers to refine the area of interest through the other stages of the CWA, to inform a more concise identification for strategies associated with activities or control tasks that are prioritized.

Social Organization and Cooperation Analysis (SOCA)

The SOCA involves identifying how activities and strategies are and can be distributed between agents (human and non-human) within the system. SOCA is undertaken on outputs from the other CWA phases, e.g. SOCA-WDA, SOCA-CAT, SOCA-DL. To begin, it is important to first define a set of actors. Nodes within the selected phase are then shaded to show who/what does and could do what

SOCA leads the analyst to recognise that organisational structures in many systems are generated in real time by multiple, cooperating actors

responding to the local context (Jenkins, 2008). In the words of sociotechnical theory, this would be a demonstration of the autonomy granted to groups and the freedom that members of a group have to regulate their internal states and relate themselves to the wider system. SOCA is, therefore, expressive of the 'simple organisation/complex job' philosophy. It is not necessarily concerned with planning upfront the nature of organisational structures that should be adopted in different situations. It is instead worried about identifying the set of possibilities for work allocation, distribution and social organisation. SOCA explicitly aims to support flexibility and adaptation in organisations (the sociotechnical principle of 'equifinality'; Bertalanffy 1950) by developing designs that are tailored to the requirements of the various possibilities (the sociotechnical principle of 'multifunctionality'; Cherns 1987). SOCA thus models the constraints governing the division of tasks between the resources and addresses how the team communicates and cooperates. The objective is to determine how the social and technical factors in a system can work together in a way that enhances the performance of the system as a whole.

Worker Competency Analysis (WCA)

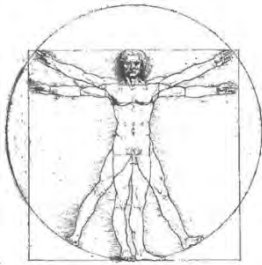
WCA involves identifying the cognitive skills required for different control tasks. This utilizes Rasmussen's (1983) skills, rules and knowledge framework (SRK). This involved the classification of control tasks as requiring either skill, rule or knowledge-based processing and determining how well system supports level of cognition required. Skill-based behaviour is associated with sensory-motor performance which occurs in skilled activity without conscious control being required. Rule-based behaviour refers to the application of stored rules, based on past experience, to determine behaviour. Knowledge-based behaviour is associated with unfamiliar situations where it is not possible to draw upon past experience and the actor must engage in reasoning to understand the situation and select an appropriate course of action. The final phase of the CWA framework, worker competencies analysis (WCA), involves identifying the competencies that actors require for performing the required activity within the system under analysis. WCA is concerned with making the task easier

for the end user by use of techniques such as mental models (Jenkins, 2008).

Summary

The phases of CWA are interconnected, and this high level of interconnectivity is one of the strengths of the CWA framework. The domain is first analysed independent of activity in the WDA; here, the constraints bound by the functions that the physical objects can perform are captured. Known recurring tasks can be extracted from the products of the WDA and analysed in greater detail in the ConTA, which considers how the constraints imposed by the geographical location of the activity affect what functions are possible. The activities identified in ConTA are explored in detail in the strategy's analysis. All three of these phases then feed into the SOCA phase, where they are coded to indicate which of the actors can be associated with parts of the process (Jenkins, 2008).

Appendix 2: Letter to Participants



THE DEPARTMENT OF HUMAN KINETICS AND ERGONOMICS

Cell: 0732121311

Email: g08r5157@campus.ru.ac.za

Dear Participant

Thank you for showing interest in my project entitled 'The use of human factors and ergonomics systems tools to understand constraints and affordances within South African football: A case study of grassroots football development in Makhanda, Eastern Cape'. This letter will explain the aims, procedures, and feedback related to this project.

Aims

The aim of this research is to develop a system model of the Makana Local Football Association (LFA). Football is very important to South African society, particularly amongst those who are previously disadvantaged. Furthermore, infrastructure relating to the national body (South African Football Association SAFA) are often disconnected from the reality of football development at a grassroots level. As we know, there is a lack of resources for LFAs, and so it is important to understand how the LFA works, so it can achieve its goals of producing and developing talent, as well as encouraging mass participation. The aim of the current research is therefore to analyse the Makana LFA, to identify the realities facing administrators and attempt to understand the limitations and opportunities for those involved.

Procedure

The analysis will involve all committee members currently within the Makana LFA system. This is because you are the experts, and have unique knowledge of how the LFA works. We refer to those experts as Subject Matter Experts (SME) and it is SMEs who develop the system model. The researcher (myself) acts as a facilitator to assist you in developing this model or picture of the system. In order to develop a system model, the researcher will be using a method known as Cognitive Work Analysis. This is a tool that involves open discussion, involving workgroups with stakeholders to gradually develop a system model or image of the LFA. This model will be constantly changing as the analysis continues and we adjust. All information regarding meetings, decisions and any important details regarding analysis will be communicated to you at all times.

Risks and benefits:

There is minimal physical risk associated with the current project. There is however risk that may be present in terms of alienation, embarrassment and personal feedback issues relating to this project. This is due to the open natured discussion associated with the analysis tool. However, as all participants are members of the Makana LFA, you will be familiar with your colleagues. Furthermore, the aim is to improve the LFA, with SMEs identifying how the system works. There will be significant benefits associated with the project. On a personal level in terms of understand the LFA and required jobs. Benefit to the soccer playing community of Makana through improving the LFA. And finally, to the broader SAFA structure as this will serve as a blue print for the optimization of LFAs country wide.

Anonymity and Feedback

Due to the discussion-based nature of the analysis tool, it is impossible to maintain anonymity within analysis due the workgroup nature of analysis. However, all the information will be anonymous and at no time will your name be used within reporting or documenting of the process. Your role will be referred to as your position within the LFA. The data collected will be used for research purposes and kept in the HKE department. Please note

that you are allowed to withdraw from the study at any time during experimentation. Following the testing, you will receive a breakdown of the results from the project if you wish. Thank you for agreeing to participate in my project. If you have any questions feel free to contact me.

Yours Sincerely,

Ben Ryan

Appendix 3: Informed Consent



THE DEPARTMENT OF HUMAN KINETICS AND ERGONOMICS

Cell: 0732121311

Email: g08r5157@campus.ru.ac.za

'The use of human factors and ergonomics systems tools to understand constraints and affordances within South African football: A case study of grassroots football development in Makhanda, Eastern Cape'

I, _____ having been fully informed of the research project entitled; ' The use of human factors and ergonomics systems tools to understand constraints and affordances within South African football: A case study of grassroots football development in Makhanda, Eastern Cape', hereby give my consent for the above-mentioned research to proceed. I further give permission as the chairperson of the Makana LFA, for the researcher to approach committee members regarding the research protocol.

I am fully aware of the research procedures involved with this study, as well as any potential risk and benefits that may be associated with my participation. This has been explained extensively, both verbally and in writing. In agreeing to participate in this study, I wave any legal recourse against the researchers from the HKE Department of Rhodes University, from any claims resulting from personal injury whilst participating in the above research project.

I am fully aware that the HKE Department is not responsible for any injuries due to personal negligence and non-compliance. I am aware that I may withdraw my consent and from participation in the study at any time without negative repercussions. I am aware that my anonymity will be protected at all times by the researcher, and agree that all the information collection during this research project may be used and published for statistical or scientific purposes.

I have read the letter of information accompanying this form in its entirety and understand its components completely. Any questions which I may have had, have been answered entirety and to my satisfaction.

I therefore consent to participate voluntarily in this research project.

Participant Providing Consent:

(Print Name) (Signed) _____
(Date)

Witness:

(Print Name) (Signed) _____
(Date)

Researcher Administering Informed Consent:

(Print Name) (Signed) _____
(Date)

Appendix 4: Participants Background Questionnaire

Questionnaire

Name: _____

Age: _____

Ethnicity and Home Language: _____

Education:

Occupation:

Position in the Makana LFA:

Experience in the Makana LFA:

Qualifications relating to Administration:

Football related Qualifications:

Why did you volunteer to be a member of the committee?

Appendix 5: Workshop Evaluation questionnaire

Participant Name (optional): _____

Date: _____

LFA Position: _____

Years in present position? _____

INSTRUCTIONS

Please circle your response to the items. Rate aspects of the workshop on a 1 to 5

scale:

1 = "Strongly disagree," or the lowest, most negative impression

3 = "Neither agree nor disagree," or an adequate impression

5 = "strongly agree," or the highest, most positive impression

Choose N/A if the item is not appropriate or not applicable to this workshop.

Your

feedback is sincerely appreciated. Thank you.

WORKSHOP CONTENT (Circle your response to each item.)

1. I was well informed about the objectives of this workshop. 1 2 3 4

5 N/A

2. This workshop lived up to my expectations. 1 2 3 4 5 N/A

3. The content is relevant to my role in the LFA. 1 2 3 4 5 N/A

WORKSHOP DESIGN (Circle your response to each item.)

4. The workshop objectives were clear to me. 1 2 3 4 5 N/A

5. The workshop activities stimulated my learning. 1 2 3 4 5 N/A

6. The activities in this workshop gave me sufficient practice and feedback.

1 2 3 4 5 N/A

7. The difficulty level of this workshop was appropriate. 1 2 3 4 5

N/A

8. The pace of this workshop was appropriate. 1 2 3 4 5 N/A

WORKSHOP INSTRUCTOR (FACILITATOR) (Circle your response to each item.)

9. The instructor was well prepared. 1 2 3 4 5 N/A

10. The instructor was helpful. 1 2 3 4 5 N/A

WORKSHOP RESULTS (Circle your response to each item.)

11. I accomplished the objectives of this workshop. 1 2 3 4 5 N/A

12. I will be able to use what I learned in this workshop. 1 2 3 4 5 N/A

SELF-PACED DELIVERY (Circle your response to each item.)

13. The workshop was a good way for me to learn this content. 1 2 3 4

5 N/A

14. How would you improve this workshop? (Check all that apply.)

Provide better information before the workshop.

Clarify the workshop objectives.

Reduce the content covered in the workshop.

Increase the content covered in the workshop.

Update the content covered in the workshop.

Improve the instructional methods.

Make workshop activities more stimulating.

Improve workshop organization.

- ___ Make the workshop less difficult.
- ___ Make the workshop more difficult.
- ___ Slow down the pace of the workshop.
- ___ Speed up the pace of the workshop.
- ___ Allot more time for the workshop.
- ___ Shorten the time for the workshop.
- ___ Improve the tests used in the workshop.
- ___ Add more video to the workshop.

15. What other improvements would you recommend in this workshop?

16. What is least valuable about this workshop?

17. What is most valuable about this workshop?

18. Any other comments

Appendix 6: Work as Prescribed – Work Domain Analysis

Functional Purpose

1. Administrate Football– Organization of local football. Paper trail and establishing consistent rules and regulations relating to the LFA. Draw up regulations and ensure enforcement. Settle disputes. Manage funds. Affiliate to regional level. Emphasize not for profit status. Power to make rules not consistent with the original statute document.
2. Develop Football– Create an environment for personal and community growth through football. Protecting interests of members. Developing playing facilities. Fair employment and equal opportunity.
3. Coordinate Football – Manage resources and communications. Control and supervise all football related activities. Select local and regional teams for participation in broader structures.
4. Promote Football – Increase interest and participation in football. Assist individuals to promote ideas and concepts consistent with aims and objectives.

Values and Priorities

The preamble indicates a number of values important to the operation of the LFA. Within the constitutional document, some values are explicitly stated such as (anti)discrimination and integrity. Others were identified through occurrence and perceived importance.

1. Public Benefit (3) – Organizational status is a paramount value to its operation. Important value to achieve all purposes of the LFA. Inclusion of not-for-profit status.
2. Anti (discrimination) (4) - Acknowledging historical discrimination and noting the important role SAFA and relating bodies play in reunification and reconciliation. Inclusion of non-sexist and non-racial. Unity, peace and harmony as vitally important.

3. Participation (1) – Minimal mention in document, but implied value to achieve overall purpose. The more community members involved, the greater positive influence on society.
4. Fair play (9) – Multiple mentions. An important value of fairness and equality. Sportsmanship (1) and humanitarian values (2), explicitly stated as a fundamental principle, are included here.
5. Democracy (5) – Equal rights and access. All individuals viewed as equal before the law and no infringement on individual rights, in line with the South African constitution.
6. Loyalty (1) – Explicitly stated as a fundamental principle in section 4. A vital characteristic of a tolerant and integrated society.
7. Integrity (5) - Explicitly stated as a fundamental principle in section 4. As the governing body, the LFA must remain objective.
8. Compliance (11) – Abiding by the various documentation associated with association football is a definitive value.
9. Accountability (1) – Acknowledging the need for transparency and accountability within the LFA and relating SAFA structures. Important within the preamble.

Functions

Within the Work Domain analysis, functions denote how work is broadly categorized. In the case of the LFA, work is distributed by committee. Due to the nature of the SOCA phase of the CWA process, it is an important distinction. Rather the work prescribed, which is then performed by members associated with the committee. Thus, functions for the current analysis were listed including the LEC and standing committees.

1. Executive Administration
 - Function of overseeing operations of the LFA. Organization and administration of the LFA
2. Finance and Procurement
 - Monitor and manage financial matters of the LFA

3. Audit and Risk

- Ensure completeness and reliability of financial accounting.
Review external auditors

4. Competitions

- Monitor and organize competitions in line with regulations and constitution of the Makana LFA

5. Technical Development

- Analyse basic aspects of football training and technical development. Improve these methods and qualifications of coaches, and the teaching of the game.

6. Referees

- Supervise and monitor the implementation and application of the laws of the game

7. Legal and Constitutional Affairs

- Analyse basic legal issues relating to football and relating statutes

8. Women's Football

- Manage women's football development

9. Youth Football

- Conceptualize, guide and implements associations youth development framework

10. Futsal

- Organizing and Monitoring futsal competitions

11. Sports Medicine

- Advise LEC on best practice for medicine, physiology and hygiene

12. Player Status

- Monitoring compliance to transfer regulations

13. Ethics and Fair Play
 - Monitoring ethics in football and the promotion of fair play
14. Media
 - Manage Makana LFA media presence
15. Football and Strategic Studies
 - Deal with general issues including relations with leagues, clubs and SAFA structures
16. Commercial and Marketing
 - Conceptualizing and coordinating commercial policy
17. Remuneration
 - Determine remuneration payable to LFA members
18. Safety and Security
 - Examine every aspect of security inside Stadia and immediate vicinity
19. Dispute Resolution
 - Dealing with disputes not provided for in the disciplinary code
20. Membership Affairs
 - Advise LEC on member status
21. Regional Affairs
 - Recommend approval of local competitions by LEC
22. Local Disciplinary Committee
 - Chairperson should have legal qualifications
 - Implementation of Disciplinary code of SAFA
 - Describe sanctions outlined in accompanying documentation for all members
 - Subject to disciplinary powers of congress

Activities

Executive Administration

- Congress
 - Oversee all congress organization. Electoral, annual and emergency.
- Role Delegation
 - Delegation of standing committees. Appointment of auditors
- Affiliation
 - Oversee affiliation and membership of members
- Monitoring and Evaluation
 - Manage internal organization of LFA

Finance and Procurement

- Analyse Budget
 - Analyse the budget and financial statements prepared by the treasurer
- Report Development
- Asset Management
 - Advise LEC on management of assets, as well as human resources and administration in general

Audit and Risk

- Audit Review
 - Ensure completeness and reliability of financial accounting. Review external auditors
- Proposal Development
 - Submit proposals on financial system and accounting.
- Report Development

Competitions

- Monitoring and Evaluation
 - Monitor and organize competitions in line with regulations and construction of the Makana LFA
- Competitions Structure
 - Monitor and implementation of guidelines for efficient management of competitions
 - Develop competitions calendar
- Review
 - Examine and approve new competitions under its jurisdiction
- Report development
 - Submit reports to LEC

Technical Development

- Technical Strategy
 - Analyse basic aspects of football training and technical development. Improve these methods and qualifications of coaches, and the teaching of the game.
- Professional Development
 - Organize courses and conferences for instructors, trainers, coaches and administrators
- Report Development
 - Compile material for players, coaches and administrators
 - Submit reports to LEC

Referees

- Monitoring and Evaluation
 - Supervise and monitor the implementation and application of the laws of the game
 - Appoint referees for all matches under Makana LFA jurisdiction

- Establish uniformity of methods of refereeing and inspection of referees
- Database
 - Compile a list of referees for local and regional matches
- Professional Development
 - Organize courses for referees
 - Draw up list of instructor and relevant material

Legal Affairs

- Monitoring and Evaluation
 - Analyse basic legal issues relating to football and relating statutes
 - Resolve disputes and give advice on cases or enquiries
 - Ensure all LFA documentation is up to date
 - Supply a panel of prosecutors for Makana LFA cases
 - Assist in player agent accreditation processes
- Report Development
 - Issue memoranda sharing lessons learnt from disciplinary committee, appeals board and arbitration decisions.
 - Submit reports to LEC
- Review
 - Review sponsorship and other contractual agreements of the LFA
 - Review the Makana LFA constitution

Women's Football

- Monitoring and Evaluation
 - Drafting and submitting proposals for women football development

- Dealing with all women's football matters
- Monitoring women's competitions
- Report Development
 - Submit reports to LEC

Youth Football

- Monitoring and Evaluation
 - Monitoring youth football competitions
- Proposal Development
 - Advise LEC on development policies
 - Conceptualize, guide and implements associations youth development framework
 - Advise the LEC on school football matters
- Report Development
 - Submit reports to LEC

Futsal

- Monitoring and Evaluation
 - Organizing and Monitoring futsal competitions
- Proposal Development
 - Advise LEC on developing laws of the game and developing Futsal
 - Drafting policy documentation
- Report Development
 - Submit reports to LEC

Sports Medicine

- Establish Best Practice

- Advise LEC on best practice for medicine, physiology and hygiene
- Generate Documentation
 - Develop medical guide for coaches' players and referees
 - Prepare memorandum for physical preparation, nutrition and sports hygiene
 - Develop instructions regarding medical facilities for events
 - Recommendations for prevention and treatment of injury
 - Developing and maintaining regulations for doping control
- Report Development
 - Submit reports to LEC

Player Status

- Monitoring and Evaluation
 - Monitoring compliance to transfer regulations
 - Determining players status for competitions
- Report Development
 - Submit reports to LEC

Ethics and Fair Play

- Monitoring and Evaluation
 - Monitoring ethics in football and the promotion of fair play
- Policy Development
 - Draft policies and monitoring all activities of the LFA
- Report Development
 - Submit reports to LEC

Media

- Media Strategy

- Dealing with the working conditions for the media at SAFA
- Maintain relations with media organizations
- Policy Development
 - Drafting media policy and monitoring compliance to it
- Report Development
 - Submit reports to LEC

Strategic Studies

- Liaise with Stakeholders
 - Deal with general issues including relations with leagues, clubs and SAFA structures
- Policy Development
 - Drafting policy to promote football talent in SA
- Monitoring and Evaluation
 - Monitoring implementation of policy
- Report Development
 - Submit reports to LEC

Commercial and Marketing

- Policy Development
 - Conceptualizing and coordinating commercial policy
 - Develop marketing and television strategies
- Liaise with Stakeholders
 - Dealing with sponsorship and commercial matters
- Review
 - Advise LEC on commercialization
- Report Development
 - Submit reports to LEC

Remuneration

- Budget Analysis
 - Determine remuneration payable to LFA members
- Review
 - Determine remuneration for employees within the SAFA structures

Safety and Security

- Monitoring and Evaluation
 - Examine every aspect of security inside Stadia and immediate vicinity
- Technical Strategy
 - Improve security at matches
 - Dealing with security issues, matters of protocol
- Proposal Development
 - Develop proposals for the LEC
- Report Development
 - Submit reports to LEC

Dispute Resolution

- Monitor Statute Compliance
 - Dealing with disputes not provided for in the disciplinary code between members, Makana LFA and other stakeholders
- Report Development
 - Submit reports to LEC

Membership Affairs

- Provide Council
 - Advise LEC on member status
 - Establish effective communication systems

- Policy Development
 - Establish guidelines for viable structures to develop football
- Liaise with Stakeholders
 - Ensure members participate fully
- Monitoring and Evaluation
 - Ensure member submit annual reports
- Asset Management
 - Allocation of LFA property
- Report Development
 - Submit reports to LEC

Regional Affairs

- Provide Council
 - Recommend approval of local competitions by LEC
- Monitoring and Evaluation
 - Organize national competitions
 - Oversee members
 - Ensure competitions do not clash across levels
 - Establish authority over competitions
- Report Development
 - Submit reports to LEC

Discipline

- Monitoring and Evaluation
 - Implementation of Disciplinary code of SAFA
- Monitor Statute Compliance
 - Describe sanctions outlined in accompanying documentation for all members

Resources

1. Makana LFA Constitution
2. SAFA Uniform Rules
3. Community Members
4. Facilities
5. Venue

Connections

Fundamental Purpose

- Administrate Football
 - Public Benefit – Develop efficient football governance
 - Antidiscrimination – Ensure equal access
 - Fair play – Equal treatment
 - Democracy – Equal Opportunity
 - Integrity – Fairness and Equality
 - Compliance – Ensure compliance to SAFA documentation
 - Accountability - Transparency
- Develop Football
 - Public Benefit – Community Development
 - Participation – Increased Players numbers
 - Fair play – Equal opportunity
 - Loyalty – To community members, to take ownership of the game
 - Integrity – Allow for equal access
- Coordinate Football
 - Public Benefit – Optimized football structures

- Antidiscrimination – Equal access for all community members
- Fair play – Equal representation
- Integrity – Optimal coordination through fairness and equality
- Compliance – To SAFA policy
- Promote Football
 - Public Benefit – Greater number and community cohesion
 - Antidiscrimination – reconciliation through sport
 - Participation – Increased players numbers allows for promotion of the sport
 - Democracy – Equal opportunity
 - Loyalty – To community members
 - Integrity – To community members
 - Accountability - To community members

Values and Priorities

- Public Benefit
 - Executive Administration (Overarching authoritative body)
 - Competitions (Public health and wellness)
 - Sports Medicine (Public health)
 - Ethics and Fair play (Social cohesion)
 - Remuneration (Economic Distribution)
 - Membership Affairs (Social Cohesion)
 - Discipline (Fairness and Equality)
- Antidiscrimination
 - Referees (Authority on the field)
 - Legal Affairs (Compliance to South African constitution)

- Women's Football (Improved Representation)
- Youth Football (Instilling of positive values)
- Ethics and Fair play (Equality in all football related aspects)
- Dispute Resolution (Equal treatment and representation)
- Discipline (Ensure compliance)
- Participation
 - Competitions (Manage playing opportunities)
 - Women's Football (Equal opportunity)
 - Youth Football (Youth development as a priority)
 - Futsal (Equal representation)
 - Media (Promotion of football)
 - Commercial and Marketing (Promotion of football)
 - Safety and Security (Ensure rights of all community members)
- Fair play
 - Competitions (Equal opportunity on the field)
 - Referees (Ensure rules are enforced)
 - Legal Affairs (Resolve legal issues)
 - Player Status (Equal treatment)
 - Ethics and Fair play (Upholding South African constitution)
 - Safety and Security (Public responsibility)
 - Membership Affairs (Ensure compliance)
 - Dispute Resolution (Fairness and equality)
 - Discipline (Ensure compliance)
- Democracy
 - Executive Administration (Organization of congress. Selected representatives)

- Legal Affairs (Equal treatment)
- Women's Football (Equal rights)
- Membership Affairs (Equal rights)
- Discipline (Equal and fair treatment)
- Loyalty
 - Audit and Risk (Ensure transparency to members)
 - Finance and Procurement (Public benefit)
 - Technical Development (Community development)
 - Sports Medicine (Community development and wellness)
 - Membership Affairs (Ensure compliance and fairness)
 - Safety and Security (Ensure members rights)
 - Regional Affairs (To SAFA structures)
- Integrity
 - Audit and Risk (Financial transparency)
 - Legal Affairs (Equal treatment)
 - Player Status (Fairness and equality)
 - Ethics and Fair play (Equal treatment)
 - Strategic Studies (Community development)
 - Safety and Security (Community wellness)
 - Dispute Resolution (Equal treatment)
- Compliance
 - Executive Administration (Administrative structure)
 - Finance and Procurement (Non-profit status)
 - Audit and Risk (Non-profit status)
 - Legal Affairs (Consistency with South African constitution)
 - Ethics and Fair play (Equal treatment)

- Safety and Security (Member rights)
- Discipline (Fairness and equality)
- Regional Affairs (Linking to SAFA structures)
- Accountability
 - Executive Administration (Ensuring transparency)
 - Membership affairs (Equal treatment)
 - Technical Development (Community development)
 - Remuneration (Economic distribution)
 - Regional Affairs (SAFA infrastructure)

Appendix 7: Work as Disclosed – Work Domain Analysis

Functional Purpose

1. Mass Participation in Football
 - To get people playing football, the more the better
2. Social Cohesion through Sport
 - Encouraging platforms for community integration. Important enough to be its own node in this context, IDC. Could be considered similar to community development.
3. Community Development
 - Broader socioeconomic benefits to the local community
4. Promoting Health
 - Physical activity platforms contribute to community wellness
5. Individual Opportunity
 - Advancement Opportunities for community members. Upskilling
6. Combat Crime/occupy Community
 - High levels of crime and unemployment. Involvement in football reduces opportunity to give into temptation
7. Platform for Passion
 - A much-loved sport, provide people to follow their passion. Vertical migration, fostering wonder.

Values and Priorities

1. Increased number of Player, Refs, Administrators and Clubs.
 - We value more members of the community being involved to meet our aims. Measured through number of people associated with the program.

2. Time

- We value the time that community members (players, refs, supporters, administrators) give to local football. A key resource. We also value in the sense of remuneration for referees' and LOC members. Measured through hours contributing, including explicit financial remuneration.

3. Vertical Migration

- We value the chance for local community members to advance up the SAFA pyramid. We value being linked to the organizational structure to give the platform for coaches, refs, players and clubs. Measured through how many community members advance up the pyramid.

4. Attitudes to each other and football

- Mutual respect, integration, empathy, encouragement and healthy competition are valued. Measured through general perception, but also through disciplinary incidents.

5. Capacity Building

- Advancement of community members. Measured through increased qualifications, attendance at courses and experience.

6. Opportunities and Incentives

- A key to building capacity is incentivizing and rewarding effort. Measured through investment in awards and remuneration.

7. Dedication/Loyalty

- We value this quality in community members. Often there is minimal reward for administrators and coaches, and we value their self-sacrifice, both in time and resources. Measured through social cohesion and attitudes.

8. Compliance

- We value compliance to SAFA organizational design. Contribute to vertical migration, provides the LFA direction and structure.

9. Community Service

- We value the contribution to the community across a broad spectrum. Investment in both the skills of the community and infrastructure. Measured through investment.

Functions

General consensus was that the structure of the SAFA documentation indicates that the division of tasks for the LFA is divided across the committees. The foremost committee is the executive, with numerous standings committees.

1. Executive Committee

- In charge of the organizational and administration of the LFA. Senior committee. Currently has a number of inactive members.

2. Competitions Committee

- In charge of all activities of the LFA including organization of leagues, tournament, player registration etc. Most active in the LFA.

3. Disciplinary Committee

- In charge of all disputes in the LFA. Ensuring compliance to SAFA.

4. Referee Committee

- In charge of all referee related matters. Does not function effectively.

Activities

Executive Tasks

- Trials
 - Regional trials, selection of LFA representatives. Organizing transport.
- Affiliation
 - All members must pay affiliation. Treasurer responsibilities are typically undertaken through the executive committee. Involves keeping track of members in good standing.
- Meetings
 - Consistent meetings to oversee the functioning of the LFA.
- AGM
 - Organization of the annual general meeting. Compiling of reports
- Mobilize Resources
 - Decide on the use of resources within the LFA.
- Monitoring and Evaluation
 - Keeping track of the standing committees
- Communication
 - Communicate to football community, stakeholders and standing committees.

Competitions Committee

- Club Meetings
 - Organization meetings with clubs to decide on leagues structures, organization and other issues.
- Registration
 - Registration of layers every year

- Player/Ref Cards
 - Making cards
- Monitoring Leagues
 - Administration of the leagues throughout the year. Fixture changes and postponements etc.
- League Structure
 - Decide on the structure of the leagues based on number of teams etc
- Fixtures
 - Create and monitor fixtures
- Logs
 - Keep track of log standings. Necessary for promotion and relegation
- Tournaments
 - A number of tournaments take place through the year including preseason, heritage, NAF, build it, Engen etc. Organization of players, teams, structures etc
- Referrals
 - Dealing with disciplinary issues. Competitions is the first point of contact. A recommendation is then given to the DC.
- Player Transfer
 - Deal with player transfers during the transfer windows
- Liaise with Stakeholders
 - Engage with local stakeholders to negotiate facilities, infrastructures, resources, and sponsorship. Including DSRAC, ECAS and municipality. Sponsorship from local business and grants from SAFA region.
- Field Maintenance

- Monitor the fields, in particular JD stadium. Issues with sustainability and overuse
- Communication
 - Communicate with local clubs, administrators, and stakeholders.
- Renumeration and Purchases
 - Costing for prizes, payments for transport, field maintenance etc. Completed mainly by competitions with approval by executive

Disciplinary Committee

- Monitoring and Evaluation
 - SAFA uniform rules
- Check Cases
 - Dealing with referrals from Competitions. Enforcing
- Meetings
 - Meeting for discussion as well as hearings

Referee Committee

- Monitoring and Evaluation
 - Monitoring and selecting referees. Dysfunctional

Resources

1. Venue

- For meetings, committee, executive, AGM, clubs. We do not have our own space and so it changes often

2. Transport

- Transport around Grahamstown and to regional relation. Large burden on committee members

3. Internet/WIFI
 - Vital for communications and administration
4. Computer
 - Communications and competitions managements
5. Phone
 - Communications
6. Sponsorship
 - Highly variable and crucial to meeting so fundamental purposes
7. SAFA Documentation
 - As a structure within SAFA, we utilize their organizational prescribed framework
8. Register
 - Documentation for all meetings
9. Budget
 - Crucial for management of resources
10. Report
 - Reports to stakeholders
11. Feedback
 - Reporting back to clubs at meetings such as the AGM
12. Airtime/Data
 - Required for communication. Burden on committee members
13. Fields
 - Local facilitates such as JD Stadium, Army, Rhodes, Fiddlers green
14. Forms
 - Registration forms

15. Printer
 - Vital for printing forms and cards. Not owned and so high reliance on stakeholders
16. Laminator
 - Vital for making player and referee cards. Reliance on stakeholders.
17. Stationary
 - Completing administration and player cards
18. Electricity
 - An issue in Makhanda. Sometimes a limiting factor in meetings
19. Online Programs
 - Used for fixture management
20. Database
 - Register of players. Insufficient administrative capacity to complete this effectively.
21. Equipment
 - Used for field set ups and tournament etc
22. Bank Account
 - Management of the LFA finances. Providing a record
23. Signatories
 - Transparency through multiple signatories. Can be a delay due to all having to be present for certain activities.
24. Storage
 - Storage administrative papers

Connections

The purpose of the WDA is to utilize the abstraction hierarchy to identify how these different levels interact. How are resources connected to the fundamental purpose etc. For the purposes of the current analysis, connections will be listed downwards, starting with the fundamental purpose.

Fundamental Purpose:

- Mass Participation in Football
 - Increase of players, administrators and clubs etc (More players, more participation)
 - Time (Community times spent playing football)
 - Dedication/Loyalty (We value long term participation)
 - Compliance (SAFA mandate)
- Social Cohesion through sport
 - Time (Platform for contributing to reconciliation)
 - Attitudes towards each other and football (Value mutual respect)
 - Dedication/Loyalty (Fairness and equality)
 - Community Service (Contribution to our society)
- Community Development
 - Time (Building skills through football)
 - Capacity Building (Increased skill level across the community)
 - Opportunities/Incentives (Upskilling opportunities for community members)
 - Community Service (Self-sacrifice for the betterment of the community)

- Promoting Health
 - Increase number of players etc (More people, more active, healthier)
 - Dedication/Loyalty (Value those committed to healthy lifestyle)
 - Compliance (Part of role of the LFA is to promote physical activity platforms)
 - Community Service (Bettering the community through service)
- Individual opportunity
 - Vertical Migration (Opportunity for talent to rise)
 - Capacity Building (A chance for community members to gain skills, contributing to Community Football)
 - Opportunities/Incentives (Poverty alleviation through income)
 - Dedication/Loyalty (Value those who are dedicated to their personal development)
- Combat Crime/Occupy Community
 - Opportunities/Incentives (Positive opportunities for community)
 - Dedication/Loyalty (Value those that try to better themselves)
 - Community Service (Value self-sacrifice)
- Platform for Passion
 - Increased player numbers (More players, more competitive, more enjoyment)
 - Vertical Migration (Opportunity for community members to follow their dreams)
 - Dedication/Loyalty (Value members who are dedicated to following their passion)

Values and Priorities

- Increased number of Player, Refs, Administrators and Clubs.
 - Executive Committee (Aim to promote local football)

- Competitions (In charge of platform for competition and involvement)
 - Referee Committee (Referee recruitment)
- Time
 - Executive Committee (As volunteers, much personal time is sacrificed)
 - Competitions Committee (Significant workload)
- Vertical Migration
 - Competitions Committee (Platform for competition)
- Attitudes to each other and football
 - Executive Committee (Set the tone within local football)
 - Disciplinary Committee (Corrective measures to ensure a positive culture)
 - Referee (On field behaviour)
- Capacity Building
 - Executive Committee (Liaising with stakeholders to allow for capacity building of the community)
 - Competitions Committee (Liaising with stakeholders to allow for capacity building of the community)
- Opportunities and Incentives
 - Executive Committee (Selecting individual administrators for upskilling)
 - Competitions Committee (Allows opportunities for players and referees)
- Dedication/Loyalty
 - Executive Committee (Set the tone or culture of local football)

- Competitions Committee (Competition commitment and organization)
- Disciplinary Committee (Dealing with misconduct)
- Referee Committee (On field conduct)
- Compliance
 - Executive Committee (Organization)
 - Competitions Committee (Competitions Structures)
 - Disciplinary Committee (Dealing with misconduct)
 - Referee Committee (Uniform rules enforcement)
- Community Service
 - Executive Committee (Self sacrificial contribution to community)
 - Referee Committee (Pro-bono contributions)

Functions, Activities and Resources

Executive Committee

- **Trials** (Transport, Budget), **Affiliation** (Bank Account, Budget, Phone), **Meeting** (Venue, Transport, Internet, Computer, Phone, Register, Airtime, Report, Feedback, SAFA Documentation) , **AGM** (Venue, Transport, Internet, Computer, Phone, Register, Airtime, Report, Feedback), **Mobilize Resources** (Sponsorship, Budget, Bank Account), **Monitoring and Evaluation** (Transport, Phone, Internet, Report, Airtime, Computer), **Communication** (Internet, Data, Computer, Electricity, Phone, Transport)

Competitions Committee

- **Meeting** (Venue, Transport, Internet, Computer, Phone, Register, Airtime, Report, Feedback, SAFA Documentation), **Club Meetings** (Computer, Phone, WIFI, Airtime, Venue, Transport, SAFA

Documentation, Reports, Register), **Registration** (Forms, Internet, Computer, Printer, Meeting, SAFA Documentation), **Player/Ref Cards** (Laminator, Printer, Forms, Stationary, Database, Electricity), **Monitoring Leagues** (Transport, Communication, Equipment), **League Structure** (Bank Account, Budget, Reports), **Fixtures** (League Structure, Online Program, Internet, WIFI, Computer, Database, Field), Logs (Reports, Online Program), **Tournaments** (Computer, Meeting, Field, Data, Internet, SAFA Documentation, Equipment), **Referrals** (Reports, Feedback, Meeting, Communication, Transport, Internet, Data), **Player Transfer** (Database, SAFA Documentation), **Liaise with Stakeholders** (Meeting, Transport, Communication, Reports, Sponsorship), **Field Maintenance** (Equipment, Storage, Budget, transport, meetings), **Communication** (Internet, Data, Computer, Electricity, Phone, Transport), **Renumeration** (Signatories, Budget, Bank account, transport, Communication), **Purchase** (Budget, Transport, Equipment, Signatories, Communication)

Disciplinary Committee

- **Monitoring and Evaluation** (Communication, Meeting, SAFA Documentation, Reports), **Check Cases** (Club, Meetings, Communication, Reports, Transport, Venue, Computer, Internet, Data), **Communication, Meeting**

Referee Committee

- **Monitoring and Evaluation** (Communication, Meeting, SAFA Documentation, Reports), **Meeting, Communication**

Appendix 8: Work as Disclosed – Contextual Activity Template

1. Meeting

- Meetings including committee and the AGM mainly took place in January and February. This was due to a delay as the AGM should take place earlier in the season. The reason for the delay was the resignation of the chairperson. The volunteer nature of the LFA means that disruptions like this are not uncommon. Consistency in personal of the committees is a major concern.
- Additional meetings take place over the course of the season as issues come up. Conducting an u17 tournament to a representative for the Engen tournament, organizing first division fixtures etc.

2. Affiliation

- Affiliation payments took place from January to march. This is late. There is also often issues with clubs paying on time.

3. Mobilize Resources

- Difficult to predict as funding is such an issue for the LFA. Resources come from organizations such as DSRAC and local funders and stakeholders. This season we were forced to manage resources throughout with fixing fields, transport, reimbursements, payments for prize money, trophies, medals etc

4. AGM

- The AGM took place in January. There is significant effort for the executive to prepare for it.

5. Trials

- Regional trials take place every September. Important to note transport needs for this activity.

6. Monitoring and Evaluation

- The role of the executive is to monitor the LFA throughout the year

7. Club Meeting

- Club meetings, organized by the competitions committee, mainly took place in February and march. There were some meetings with u17 and first division clubs related to fixture changes

8. Registration

- Registration of players took place between February and march
- There is registration for the Engen tournament which requires work from the LFA

9. Player Cards

- Similar to registration, player cards were made in February and march to ensure competitions can continue

10. League Structure

- Following affiliation and the AGM, relative position of all clubs is established. Then the league structure is decided. For instance, the u17 were split into 2 streams this year due to time constraints

11. Fixtures

- The leagues began in march and it was necessary to be involved with the fixtures from commencement to tend of the season

12. Logs

- Similar to the fixtures, log updates are important for all stakeholders. DSRAC require reports and the clubs needs to know their current status in relation to promotion and relegation

13. Tournament

- We have a set number of tournaments

i. Build it u13, Top 8 Tournament, Heritage u15 Tournament, Engen u18, National Arts Festival 5 a side

- All football related activities in Makana come through the LFA and so there is high variability.

14. Referrals

- Majority of referrals came into play in May and June of the current season. More likely to occur towards the end as the stakes come into focus

15. Check Cases

- Same as referrals

16. Player Transfer

- SAFA dictates the window for player transfer. The late start made it significantly more complicated. Transfer window was between February and march.

17. Field Maintenance

- A significant issue in the LFA are the facilities. JD stadium is the only field currently operating for football. It is shared by a number of other entities. Maintenance on these fields by the Municipality is minimal and so often the LFA needs to invest to maintenance the facility. This can happen through the season.

18. Liaise with Stakeholders

- This is important throughout the year. We meet with DSRAC and the municipality regularly attempting to resolve issues

19. Communication

- Crucial throughout the year, communicating to clubs. We also submit reports to relevant stakeholders

20. Renumeration

- Payment to prize winner occurs after the league is completed

21. Purchases

- Normally occur prior to the season. This year between January and march

Appendix 9: Work as Disclosed – Strategies Analysis

ACTIVITY	PURPOSE	NEEDS	CHALLENGES/CONSTRAINTS	STRATEGIES
<p><u>Meetings</u></p>	<ol style="list-style-type: none"> 1. Update/Report to other members of the committee 2. Establish current status of the committee 3. Deal with Emergency or unforeseen scenarios 4. Plan the way forward 5. Establish definitive resolutions 	<ol style="list-style-type: none"> 1. Communication (Establish date and time of meeting, availability and inform all members) 2. Establish a venue 3. Transportation 4. Agenda 5. Committee Members 	<ol style="list-style-type: none"> 1. Resources - Airtime/Data/WIFI/Internet requirements for effective communication. <ul style="list-style-type: none"> • Not all members have access to smart phones or personal computers 2. Lack of office space and/or venues 3. Costs of transport. Variability in venue. 4. Miscommunication. Late Notice of meetings. Lack of agenda 5. Non-attendance of members. Inactive chairperson/members 	<ol style="list-style-type: none"> 1. Utilize stakeholder resources or personal resources. <ul style="list-style-type: none"> • Hand deliver/phone call for communication 2. Stakeholder resources. Utilize alternative venues such as BAB, HKE, Private vehicle etc 3. Reliance on personal resources 4. Secretary creates agenda. Confirmed at the meeting 5. A significant constraint. Quorum is vital. Inactive members influence chances to reach quorum. As a result, inactive members are not included in the calculation. But there is no formal indication of removing

				those members. It is an unenforced rule
<u>Affiliation</u>	<p>1. Contributing financially to the LFA. Sustainability of the LFA</p> <p>2. Compliance to SAFA regulations</p> <p>3. Joining fee. To ensure club status. (Similar to above)</p>	<p>1. Each club to pay a R500 joining fee. R700 for new members</p>	<p>1. Non-compliance</p> <ul style="list-style-type: none"> • Not paying on time/Not paying at all <p>2. Club Challenges</p> <ul style="list-style-type: none"> • No bank account, no email <p>3. Clubs cannot afford it. Reply on single benefactors. Some not all.</p> <p>4. Undermining of Leadership. SAB club's affiliation</p> <p>5. Late payment</p> <ul style="list-style-type: none"> • Delay the league (Major constraint) • Affects the end of the season with promotion and relegation. Affects the scheduling of the AGM <p>6. Literacy – Majority of the community are isiXhosa speakers</p> <ul style="list-style-type: none"> • All SAFA documentation is in English (formal and complex). 	<p>1. Extension of affiliation deadline (Often multiple times)</p> <ul style="list-style-type: none"> • Written warning is communicated <p>2. Physical Deposits</p> <p>3. There is some sponsorship for clubs (DSRAC, Lotto etc)</p> <p>4. Enforce the rules. Often leads to dispute resolution</p> <p>5. League is delayed.</p> <p>6. Administrators are sometimes called upon to assist clubs in engaging with the rules</p> <p>7. See 6</p> <p>8. More meetings to facilitate understanding</p>

			<p>7. Rules and Constitution is a challenge for clubs</p> <p>8. Leaders and executive members of clubs</p> <ul style="list-style-type: none"> • Often the coach is also the chairperson. Places individual strain both financially and in stress. Minimal active administrators. 	
<u>Mobilize Resources</u>	<p>1. Manage LFA resources</p> <p>2. To ensure effective organization</p> <p>3. To maximise the resources</p> <p>4. To provide the platform for competition</p> <p>5. Liaise with funders</p>	<p>1. Budget/Inventory</p> <p>2. Active committee members</p> <p>3. Resources (Funds, infrastructure – fields, office, storage, computer, equipment, referee kits)</p> <p>4. Transport</p> <p>5. Meetings (Interconnected to other activity)</p>	<p>1. Fundraising</p> <p>2. Non-active committee members</p> <p>3. Lack of storage for resources</p> <p>4. Lack of transport</p> <p>5. Lack of refs</p> <ul style="list-style-type: none"> • Issues with safety and security particularly at stadiums. Reports of confrontations during and after games as well as away from the pitch. <p>6. Meeting postponement</p> <ul style="list-style-type: none"> • Making unconstitutional decisions in order to better football. Financial decisions without approval 	<p>1. Not possible – insufficient active committee members to fundraise</p> <p>2. See 1</p> <p>3. Use private storage</p> <p>4. Private transport</p> <p>5. Not possible. Requires functioning referee committee</p> <p>6. Fixture postponement</p> <p>7. Cooperation, assist with administration</p>

		6. Human Resources (e.g. Referee)	of the committee due to time pressure. 7. Lack of Support from stakeholders (Police, EMS, Municipality, DSRAC) – Major constraint	
<u>Annual General Meeting (AGM)</u>	1. Elect Structure (Select committee members) 2. Compliance to SAFA 3. Highest decision-making body 4. Effective governance/Accountability 5. Activity Reports (Finance, chairperson, Competitions)	1. Communication 2. Venue 3. Club delegates 4. Executive Members 5. Reports 6. Agenda	1. No Auditors (Non-compliance) – Financial Report 2. Clubs not attending (or arriving late) 3. Executive Members not attending 4. Chairperson resignation – Constitutional issues 5. Poor decisions of the AGM 6. Poor Communication (Executive Committee) 7. Delays to AGM – Puts pressure on the LFA calendar 8. Clubs electing inactive committee members 9. Personal Vendetta (Politics) – delay tactics	1. Insufficient resources 2. Have an interesting item on the agenda (Motivate people to attend). 3. Significant challenge 4. Reshuffle of committee. Delays 5. Cannot be changed 6. Reliance on personal resources (Phones, personal visits) 7. Cannot be changed. Committee members need to be adaptable 8. Significant challenge 9. Stick to the constitution – stay strong

			<p>10. Club understanding of the constitution</p> <ul style="list-style-type: none"> • Technicalities (e.g. AGM vs electoral congress) <p>11. Football community members are unemployed</p> <ul style="list-style-type: none"> • They have different priorities (employment, providing for family) 	<p>and reprimand when necessary</p> <p>10. Committee members typically explain to clubs when needed.</p> <p>11. This is a national level question and needs to be engaged with</p>
<u>U19 Trials</u>	<p>1. Talent Identification</p> <p>2. Vertical Migration</p> <p>3. Exposure</p>	<p>1. Communication</p> <p>2. Transport</p> <p>3. Selection of players</p> <p>4. Documentation/ Cards</p>	<p>1. Lack of organization of the region</p> <p>2. Poor region communication (Transport costs)</p> <p>3. Players attending trials is normally based on interest of local players who are then assisted with transport to attend the trials.</p> <p>4. Finances</p> <p>5. Compensation when scouted. Player registration issues</p>	<p>1. Cannot control. Increased workload.</p> <p>2. Cannot Control</p> <p>3. Pay for transport</p> <p>4. Do not attend trials</p> <p>5. Stick to constitution</p>
<u>Monitoring and Evaluation</u>	<p>1. Ensuring subcommittees</p>	<p>1. Communication</p>	<p>1. Inactive members</p>	<p>1. Significant challenge</p>

	<p>do their jobs effectively</p> <p>2. Monitoring stakeholders</p> <p>3. Accountability</p>	<ul style="list-style-type: none"> Effective reporting and updates <p>2. Committee Members (Significant workload)</p> <p>3. Meetings</p> <p>4. Transport</p> <p>5. Long term LFA plan</p> <p>6. Facilities, Infrastructure and Resources (Bank Account, Office, Field etc)</p> <p>7. Functioning Leagues</p>	<p>2. Poor Updates, poor communication, minimal resources</p> <p>3. Disorganization of subcommittees</p> <p>4. Transport and funds</p> <p>5. Low committee member numbers</p> <ul style="list-style-type: none"> Confusion over roles and responsibilities (DSRAC vs Executive) No clear terms of reference with stakeholders <p>6. Poor facilities, no office (e.g. Juniors venue)</p>	<p>2. Committee members are adaptable</p> <p>3. Significant challenge</p> <p>4. Personal transport</p> <p>5. Engage with stakeholders. Negotiation</p> <p>6. Utilize private resources</p>
<u>Club Meeting</u>	<p>1. Information Sharing</p> <ul style="list-style-type: none"> Leagues, Fixtures, registration, tournaments (Draws), Player 	<p>1. Venue</p> <p>2. Communication</p> <p>3. Quorum (Committee and Clubs)</p> <p>4. Agenda and Credentials</p>	<p>1. Lack of venue</p> <p>2. Poor Club administration (Lack of email, no club structure, communication breakdown. Conflict)</p> <p>3. Lack of club representation (Quorum)</p> <ul style="list-style-type: none"> Inactive committee members 	<p>1. Utilize alternative venues</p> <p>2. Rely on word of mouth</p> <p>3. Postponement of meetings</p> <p>4. Longer meetings, enforce the constitution</p>

	<p>Cards, Affiliation Fees</p> <p>2. Platform for clubs</p> <ul style="list-style-type: none"> Ideas/suggestions/concerns <p>3. Inclusivity/Participatory</p> <ul style="list-style-type: none"> Clubs don't like being dictated to 	<p>5. Secretary</p> <ul style="list-style-type: none"> Minutes/documentation <p>6. Resource distribution</p> <ul style="list-style-type: none"> Cards, forms, schedules etc 	<ul style="list-style-type: none"> Misinterpretation of the rules Unnecessary questions <p>4. Clubs don't stick to the agenda</p> <p>5. Lack of Resources (Computer etc)</p> <p>6. Language barrier issues (English speaking secretary)</p>	<p>5. Assistance from stakeholders. Negotiation</p> <p>7. Other committee members translate</p>
<u>Registration</u>	<p>1. Legitimacy</p> <ul style="list-style-type: none"> Player Database <p>2. Eligibility</p> <p>3. Avoiding conflict over registration</p>	<p>1. Forms</p> <ul style="list-style-type: none"> ID, Medical Form, Club Form, Player list <p>2. Clubs</p> <ul style="list-style-type: none"> Players Administrators <p>3. Stationary</p>	<p>1. Out of Date forms being used</p> <ul style="list-style-type: none"> No Medical Form (major constraint) No Copy of ID, poor-quality photos, No player lists <p>2. Double Registration</p> <ul style="list-style-type: none"> Transfer issues Limited administrators 	<p>1. Accept incorrect forms</p> <ul style="list-style-type: none"> Shift the deadline Assist clubs with their administration <p>2. Player must choose</p> <ul style="list-style-type: none"> LFA does clearance if it is not resolved by the clubs <p>3. Utilize stakeholders' resources</p>

		<p>4. Proof of payment</p> <p>5. Cards</p> <p>6. Storage</p> <p>7. Deadlines for registration</p>	<ul style="list-style-type: none"> Lack of resources for clubs <p>3. Lack of resources (Laminator etc)</p> <p>4. Late payment, affects league structure</p> <p>5. Workload – A large amount of work for the competitions committee</p> <p>6. No office or storage space</p> <p>7. Clubs Missing deadlines</p> <p>8. Lack of player database</p>	<p>4. Extend the deadline (normally by a week)</p> <ul style="list-style-type: none"> Our role is not to punish clubs <p>5. Dedicated committee members</p> <p>6. Stakeholder resources</p> <p>7. See 4</p> <p>8. Additional workload</p>
<u>Player Cards</u>	<p>1. Identification</p> <p>2. Eligibility</p> <p>3. Avoiding disputes</p> <p>4. Compliance</p>	<p>1. Resources</p> <ul style="list-style-type: none"> Printer, laminator, laminating sheet, paper, ink, scissors, pritt, table, computer <p>2. Time/Committee Members</p> <p>3. Database</p> <p>4. Meeting</p> <p>5. Transport</p>	<p>1. Lack of resources</p> <p>2. Limited time/low number of committee members</p> <p>3. No database</p> <p>4. Lack of transport</p> <p>5. Clubs not completing forms correctly</p> <p>6. False accusations against the LFA</p> <ul style="list-style-type: none"> Player transfers <p>7. Multiple cards for 1 player</p>	<p>1. Stakeholder resources</p> <p>2. Lengthy administration</p> <p>3. Conflict resolution</p> <p>4. Private transport</p> <p>5. Extending deadline</p> <ul style="list-style-type: none"> Accept incomplete forms <p>6. Ignore and enforce constitution</p> <p>7. Not possible right now</p>

		6. Forms <ul style="list-style-type: none"> • ID Photos • ID Copy/Number • Medical form (Compliance) 7. Player insurance <ul style="list-style-type: none"> • Player details 	<ul style="list-style-type: none"> • Due to workload and lack of database 	
<u>League Structure</u>	1. Establish Divisions 2. Compliance (Age groups, promotion and relegations e.g. SAB) <ul style="list-style-type: none"> • Monitor and evaluate clubs 3. Fairness and Equity	1. Number of clubs 2. Number of players 3. Prize money 4. Awards 5. Logs 6. Fixtures (Home and Away) 7. Fields 8. Communication	1. Late registration/late affiliation 2. Poor administration of clubs 3. Lack of resources (Clubs fight, delays league) 4. Incomplete results <ul style="list-style-type: none"> • Issues with team sheets and match reports 5. Double booking of fields/ weather and unplayable conditions/ fixture changes 6. Not enough fields. Poor maintenance	1. Delay league 2. Delay league/Deadline extension <ul style="list-style-type: none"> • Assist clubs with administration 3. Be adaptable <ul style="list-style-type: none"> • Recognise the need for financial incentive (Prizes) 4. Delay logs 5. Delays 6. Delays

			7. Season starting late. Reduced schedule window	7. Delays
<u>Fixtures</u>	<ol style="list-style-type: none"> 1. Competition 2. Fairness (Home and Away fixtures) 3. Balance demands on the facilities (JD Stadium) 4. Monitor <ul style="list-style-type: none"> • Fixture changes 5. Organization 6. Compliance 7. Promotion 	<ol style="list-style-type: none"> 1. Communication 2. League structure 3. Competitions committee 4. Referees 5. Fields 6. Fixture generator 7. Log 8. Team sheets 9. Club schedule <ul style="list-style-type: none"> • When players are available (Holidays etc) 	<ol style="list-style-type: none"> 1. Lack of resources <ul style="list-style-type: none"> • Computer/Data/Office 2. Late affiliation <ul style="list-style-type: none"> • Teams dropping out 3. Insufficient human resources (Committee members, referees) 4. Dysfunctional referee committee 5. Weather delays (Unplayable fields) 6. Teams not honouring fixtures 7. Incomplete Results, Incomplete team sheets/match reports 8. Certain periods during the year when you can't have fixtures (Unforeseen circumstances, Weather, Initiation) 	<ol style="list-style-type: none"> 1. Private resources 2. Delays 3. Extension of deadline (Additional administration) 4. Active committee members contribute 5. Delays 6. Increased workload and Delays 7. Increased workload on competitions committee 8. Understandable Delays

	n and Relegation			
<u>Logs</u>	<ol style="list-style-type: none"> 1. Information sharing 2. Monitoring leagues 3. Promotion and Relegation 4. Evaluate progress 	<ol style="list-style-type: none"> 1. Online program 2. Results 3. Competitions committee 4. Club status 5. Communication 6. Resources <ul style="list-style-type: none"> • Computer 7. League structure 	<ol style="list-style-type: none"> 1. Lack of club resources 2. Lack of team sheets and match reports 3. Insufficient committee members 4. Removal of clubs due to misconduct 5. Poor understanding of uniform rules by clubs 	<ol style="list-style-type: none"> 1. Printing of fixtures for clubs 2. Delays 3. Delays 4. Delays due to administration 5. Workload <ul style="list-style-type: none"> • Explain to clubs - Educate
<u>Tournaments</u>	<ol style="list-style-type: none"> 1. Competition (Short term) 2. Talent development 3. High stakes 	<ol style="list-style-type: none"> 1. Registration of teams and players 2. Local organizing committee 3. Tournament structure 4. Match officials 5. Facilities (Fields) 	<ol style="list-style-type: none"> 1. Miscommunication <ul style="list-style-type: none"> • Coaches lack of discipline • Poor administration of clubs 2. Not enough committee members 3. Late registration 4. Ill-discipline <ul style="list-style-type: none"> • Pressure on referees 	<ol style="list-style-type: none"> 1. Delays 2. Increased workload 3. Delays – increased workload 4. Dispute Resolution 5. Delays <ul style="list-style-type: none"> • Increased workload 6. Delays

	<ul style="list-style-type: none"> Greater interest from teams <ol style="list-style-type: none"> Different game types (5 a side) Motivation 	<ol style="list-style-type: none"> Entry Fee Awards (Trophy, medals) Tournament Rules 	<ol style="list-style-type: none"> Seriousness of referees and incentives for refs Not enough fields Weather Lack of funds for clubs Funds/resources Issues with stakeholders Compliance Misinterpretation, Unclear rules 	<ol style="list-style-type: none"> Stakeholder resources Negotiation with stakeholders Ensure compliance to SAFA
<u>Referrals</u>	<ol style="list-style-type: none"> Compliance Effective procedure Judgement on disputes Merits/demerits 	<ol style="list-style-type: none"> Documentation <ul style="list-style-type: none"> Team sheets/match reports Communication <ul style="list-style-type: none"> Competitions to DC Case number <ul style="list-style-type: none"> Information about disputes Competitions committee 	<ol style="list-style-type: none"> Media Conflict of interest Incomplete documentation Clubs don't know the rules <ul style="list-style-type: none"> Defy rules Protest vs appeal Excuses by clubs Clubs looking for special treatment Misunderstanding role of DC vs competitions 	<ol style="list-style-type: none"> Do not engage media Consistency with constitution Ensure Fairness and Equality. Encourage resubmission Committee members explain Engage with clubs. Establish way forward Consistency with constitution

	<p>4. Scrutiny</p> <ul style="list-style-type: none"> • Develop recommendation 	<p>5. Integrity</p> <ul style="list-style-type: none"> • Consistency <p>6. Ethical leadership</p> <p>7. Constitution/Rules</p>	<p>8. Lack of numbers</p> <p>9. Manipulation of cases</p> <p>10. Lack of ethics</p> <ul style="list-style-type: none"> • Clubs with special treatment <p>11. Lack of understanding</p>	<p>7. Consistent Application of rules</p> <p>8. Increased workload</p> <p>9. Paper trail (No heresy)</p> <p>10. Follow procedure</p> <p>11. Committee members explain</p>
<u>Check Cases</u>	<p>1. Verification of processes</p> <p>2. Compliance/Legal Insight</p> <p>3. Instil discipline</p> <p>4. Fairness</p> <p>5. Settle disputes/Complaints</p> <p>6. Approvals (DC)</p>	<p>1. Members of the DC</p> <p>2. Reports/Documentation from Competitions</p> <p>3. Constitution</p> <p>4. Compliance of Clubs</p> <p>5. Communication</p> <p>6. Transparency</p> <p>7. Hearings</p> <p>8. Case Numbers</p>	<p>1. Poor reports from match officials</p> <p>2. Media interference</p> <p>3. Misunderstanding between competitions and DC. Introduction of new rules by SAFA</p> <p>4. Poor behaviour of Clubs/Players</p> <p>5. Procedure/Rules</p> <ul style="list-style-type: none"> • Complaint vs Dispute <p>6. Clubs sending players to hearings instead of Managers</p> <p>7. Lack of club structures</p> <p>8. Club defiance</p>	<p>1. Consultation/Discussion with Refs</p> <p>2. Don't not entertain media</p> <p>3. Improved communication</p> <p>4. Nothing</p> <p>5. Committee explanation</p> <p>6. Increased workload and explanation</p> <p>7. Verification of information. Expanded processes</p>

	<ul style="list-style-type: none"> Endorse and communicate decisions 	<ul style="list-style-type: none"> 9. Witnesses/Plaintiff/Defendant 10. Legal Desk 	<ul style="list-style-type: none"> 9. False testimony 10. Heresy 11. Lack of legal expertise 12. Confusion between rules and laws 	<ul style="list-style-type: none"> 8. Defer 9. Explanation and additional workload to uncover 10. Consistency with Constitution 11. Nothing 12. Workshop, additional workload
<u>Player Transfers</u>	<ul style="list-style-type: none"> 1. Fairness 2. Procedure/Compliance 3. Proof/Records 4. Membership 	<ul style="list-style-type: none"> 1. Communication 2. Documentation <ul style="list-style-type: none"> • Clearance certificate • Transfer Request 3. Timeline 4. Database 5. Competitions Committee 6. Compliance 	<ul style="list-style-type: none"> 1. Non-compliance 2. Clubs don't release players 3. Financial compensation issues <ul style="list-style-type: none"> • No money in rules • R500 as standard • Verbal agreements 4. Misleading Players <ul style="list-style-type: none"> • Lying about requests 5. Player and Club Relations 6. Clubs don't respond to committee correspondence 	<ul style="list-style-type: none"> 1. Police Affidavit for transfer documentation 2. Compliance - Association releases players (last resort) 3. Consistency with constitution 4. Verification - additional workload 5. Verification with Clubs 6. Committee members act as Mediator

		<p>7. Reporting to Competitions</p> <p>8. Clearance from Region</p>		
<p><u>Field Maintenance</u></p>	<p>1. Ensure long term use</p> <p>2. Ensure playable field</p> <p>3. Player/Referee Safety and Security</p> <p>4. Compliance</p>	<p>1. Fields</p> <p>2. Committee Members</p> <p>3. Transport</p> <p>4. Clay/Resources/Poles/Nets</p> <p>5. Communication</p> <p>6. Caretaker</p> <p>7. Municipal cooperation</p> <p>8. Lights</p> <p>9. Booking</p> <p>10. Change room</p>	<p>1. Security at JD Stadium</p> <p>2. Municipality Relations</p> <p>3. Current state of facility (Poor condition)</p> <p>4. Double booking</p> <p>5. Vandalism</p> <p>6. Wear and tear on the field</p> <p>7. Caretaker Negligence</p> <p>8. Club frustration</p> <p>9. Lights and change room</p> <p>10. Poor infrastructure</p> <p>11. Wasting LFA resources</p> <p>12. Illegal use</p>	<p>1. Nothing</p> <p>2. Nothing</p> <p>3. Invest our own money</p> <p>4. Delay or change fixture</p> <p>5. Nothing</p> <p>6. Nothing</p> <p>7. Nothing</p> <p>8. Clear explanation</p> <p>9. Nothing</p> <p>10. Nothing</p> <p>11. Nothing</p> <p>12. Nothing</p>
<p><u>Liaise with Stakeholders</u></p>	<p>1. Assistance</p>	<p>1. Communication</p> <p>2. List of stakeholders</p>	<p>1. Miscommunication</p> <p>2. Word of mouth culture</p>	<p>1. Follow up</p> <ul style="list-style-type: none"> • Visit/Call/Write

	<p>e with Association</p> <p>2. To link with stakeholders</p> <ul style="list-style-type: none"> Information sharing <p>3. Engage resources</p> <p>4. Strengthen relationship</p> <p>5. Social cohesion</p>	<p>3. Transport</p> <p>4. Meetings</p> <p>5. MOU with each stakeholder</p> <p>6. Transparency</p> <p>7. Tools of trade</p> <ul style="list-style-type: none"> Computer <p>8. Accountability</p>	<ul style="list-style-type: none"> Verbal agreements (Phone calls) <p>3. One-way transparency</p> <ul style="list-style-type: none"> Loss of faith in stakeholder <p>4. Lack of records</p> <ul style="list-style-type: none"> Portfolio of evidence <p>5. Lack of resources</p> <ul style="list-style-type: none"> Reliance on stakeholders <p>6. Misunderstanding of roles</p> <p>7. Channels of reporting</p> <p>8. Prizes</p> <ul style="list-style-type: none"> Empty promises <p>9. Interference in our work</p>	<ul style="list-style-type: none"> Meeting <p>2. Uncertainty over service delivery</p> <p>3. Ensure LFA is operating efficiently</p> <p>4. Nothing</p> <p>5. Delay activities</p> <p>6. Negotiate</p> <p>7. See 1</p> <p>8. Delay awards ceremonies</p> <p>9. Be adaptable</p>
<p><u>Monitor League</u></p>	<p>1. Planning</p> <p>2. Organization</p> <ul style="list-style-type: none"> Current Status 	<p>1. Office resources</p> <ul style="list-style-type: none"> Transport, computer, stationary <p>2. Match Reports</p> <p>3. Committees</p> <p>4. Records</p>	<p>1. Delayed start</p> <ul style="list-style-type: none"> Late AGM etc <p>2. Lack of fields</p> <ul style="list-style-type: none"> Only have JD Stadium <p>3. Clubs dropping out</p> <p>4. Weather/Double booking</p>	<p>1. Nothing</p> <p>2. Balance demands on facility</p> <p>3. Additional administration</p> <p>4. League delay/Fixture changes</p>

	<p>3. Improvement</p> <p>4. Fairness (Balance between the leagues)</p> <p>5. Compliance</p>	<p>5. Logs and fixtures</p> <p>6. Communication</p> <p>7. Rules and Constitution</p> <p>8. Honesty/Transparency</p> <p>9. Deadlines</p>	<p>5. Lack of resources</p> <ul style="list-style-type: none"> • Office/Human resources etc <p>6. Coach Frustration</p> <p>7. Poor communication</p> <ul style="list-style-type: none"> • Clubs don't have WhatsApp or email <p>8. Poor reporting</p> <p>9. Poor understanding by clubs</p> <p>10. No prizes</p> <p>11. Media interference</p> <ul style="list-style-type: none"> • Publishing logs etc <p>12. Clubs requesting postponement</p> <ul style="list-style-type: none"> • Funerals, late notice <p>13. Administration</p>	<p>5. Utilize stakeholder resources</p> <p>6. Clear explanation from committee members</p> <p>7. Phone calls/printouts/explanation</p> <p>8. Delays to league</p> <p>9. Explanation – Delays</p> <p>10. Delay award ceremony</p> <p>11. Ignore</p> <p>12. League delays</p> <p>13. Delays</p>
<u>Communication</u>	<p>1. Information Sharing</p> <ul style="list-style-type: none"> • Two-way dialogue 	<p>1. Resources</p> <p>2. Communication Desk</p> <ul style="list-style-type: none"> • Contact Details 	<p>1. Clubs don't have emails</p> <p>2. Lack of resources for clubs and committee members</p> <ul style="list-style-type: none"> • Data/WIFI/internet etc <p>3. Changing club representatives</p>	<p>1. Other communication avenues</p> <p>2. Private resources</p> <p>3. Nothing</p> <p>4. Nothing</p>

	<p>2. Transparency/Openness</p> <p>3. Records</p> <p>4. Organization</p> <p>5. Awareness</p> <p>6. Consultation</p>	<ul style="list-style-type: none"> • Email/WhatsApp/Facebook <p>3. Clear Instruction</p> <p>4. Accurate information</p> <p>5. Resolutions</p> <p>6. Committee/Clubs</p> <p>7. Compliance</p> <ul style="list-style-type: none"> • Timelines/procedure • Uniform rules etc <p>8. Visibility</p> <ul style="list-style-type: none"> • Log updates etc <p>9. Meetings</p>	<p>4. Clubs don't communicate with committees</p> <p>5. Propaganda</p> <ul style="list-style-type: none"> • Ill-informed communication • Misinformation (Delaying tactics) <p>6. Clubs not understanding procedure</p> <p>7. Lack of correspondence</p> <p>8. Lack of human resources</p> <p>9. Clubs not attending meetings</p> <p>10. Documentation</p> <ul style="list-style-type: none"> • Portfolio of evidence (POE) 	<p>5. Portfolio of evidence – Transparency</p> <p>6. Explanation by committee members</p> <p>7. Nothing</p> <p>8. Nothing</p> <p>9. Communicate reminders and resolutions</p> <p>10. Stakeholders resources</p>
--	---	--	---	---

<u>Renumeration</u>	1. Reward/Incentivize 2. Community Development 3. Income Relief 4. Alleviate Poverty	1. Funds 2. Budget/Plan 3. Stakeholders 4. Banking details/Bank Account 5. Signatories 6. Bank Visit 7. Transport	1. Clubs don't have bank accounts 2. Delayed payments 3. Lack of funds/resources 4. Lack of auditors 5. Bank Visit • Increased Workload 6. Lack of Sponsorship 7. Disputes over prize pool 8. Signatories leaving LFA	1. Cash payments (Refs etc) 2. Nothing 3. Nothing 4. Nothing 5. Private resources 6. Nothing 7. Engage at AGM 8. Nothing – lack of time
<u>Purchases</u>	1. Invest in Resources • Equipment, Field Maintenance, Stationary 2. Fulfil budget responsibilities	1. Bank account 2. Budget 3. Paper trail • Invoice 4. Inventory 5. Bank visit 6. Signatories 7. Committee Resolution	1. Emergency Payment 2. See renumeration for similar challenges 3. Lack of funds 4. Lack of stakeholder support • Verbal agreements 5. Don't have inventory	1. Fastrack payments 2. See renumeration above 3. Nothing 4. Nothing 5. Private or stakeholder resources

	3. Pay for transport (Engen etc) 4. Invest in community 5. Capacity Building	8. Financial Report		
--	--	---------------------	--	--

Appendix 10: List of Direct Quotes from Subject Matter Experts

Audio File link:

<https://drive.google.com/drive/folders/19HBIYoUaariW4NkOe7LsBLry52s5zwn4?usp=sharing>

Quote from Subject Matter Expert		Session and Minute
1	We don't really do talent identification, as an LFA	4,75
2	Development committee? Do you actually meet? No. Competitions does that. Should be its own committee but we don't have the means	1,73
3	Giving people opportunities to better themselves – community development	1,36
4	Promoting a healthy lifestyle and health awareness	1,38
5	To avoid crime and to keep the guys busy. Fighting crime and keeping them away from drugs. Giving them passion	1,40
6	The region is responsible for that communication. That's where the issues are.... when and where they are going to happen come from the region. They are disorganized, and it makes it difficult to plan and budget for it	4,85
7	You want lots of people to move up that pyramid	1,49
8	If you are not the strongest at academics, there is still a way for you to change...where you are...have opportunities	1,39
9	Getting people to be there is the first step	1,55
10	Our administration... it's not good	2,130
11	We need better systems	2,130
12	What do we mean by our volunteers? We mean administrators, standing committee members and clubs	1,89

13	We must all be in the discipline and competitions committees. We have such a small number of active people	2,120
14	That's the problem with volunteers. People just don't want to do it	4,120
15	We need courses or workshops for the executive. It is very important for all to attend the workshops. As a leader, you need to know the laws of the game. You need a clear understanding of the laws, especially these days (due to internal conflict)	1,120
16	There are some committees that happen, some that are dysfunctional and some that don't happen at all	1,72
17	An issue is the nonattendance of members. An issue is we have no chairperson. We currently don't have a leader	3,13
18	Work in this LFA is full time, I don't want to lie. Because you volunteer full time. This is a job; you just don't get paid	4,134
19	Our club leaders are not that educated. I'm not trying to undermine anyone. These things are all written in English and coaches can't even interpret (the rules). That's why people don't want to be active in the executive. Even the explanation of the rules, they come to me personally to explain, what does it mean, can you explain the regulation in isiXhosa. We are in trouble	3,66
20	These are the knock-on effects. Misunderstanding affects the discipline committee. Clubs can't interpret the rules. I feel sorry for clubs. They are leaderless. The blind leading the blind	3,72
21	Is it a must that we need to follow the constitution at this level? We should have a policy of our own. Make it simple, and make it work for here. To apply things for our amateur football	5,38
22	Fundraising - We do it but we don't get it	2,50
23	We don't have our own venue or office space. As well as airtime, data or internet	3,8
24	We assume that all committee members have phones or computers, which is not always the case	3,9

25	If you look at these rules, they are made for professional clubs. For people who are employed. The constitution does not assist us. It binds us	5,97
26	We are limited in what we can use and what we have. We rely on others	7,74
27	The thing about no auditors is that its noncompliance to SAFA regulations. And that's a challenge. But it's because of finance and sponsorship. We can't afford it. And funders require this information	4,25
28	We value time because the issue..., with those of us who are there (at the field), we value time and money. These people need to be paid. So, we value money based on the work they have done. -----They should give incentives, rewarding involvement	1,65
29	We don't have our own resources, so we have to go and print at DSRAC	5,15
30	There is no municipal cooperation	7,59
31	The association writes to them but they don't deliver. That is why we are being more forceful. Because we are vulnerable. We have no evidence of our conversations and meetings. That's why we ask for documents that say you will give us these items. They say there isn't any document, but we say we need one	3,117
32	Who is supposed to give us an office? DSRAC or municipality? Who is our umbrella? DSRAC. There is supposed to be a sports council I think, which doesn't exist. DSRAC will be quiet	2,130
33	We need what works for our level. Not everything in the SAFA document is relevant	3,68
34	But when it comes to the work we wanted to comply. Our compliance resulted in issues. It does not work	2,74
35	SAFA documentation is very complex. It comes back to that complexity. The level of understanding of our local clubs is not high	3,67

36	Even if clubs are late (with affiliation), we take them. The same clubs swear at us, the same ones we helped	1,45
37	Member attendance at meetings. Is there a rule? It needs to be over 50% (to reach quorum). So, there is a rule, but it isn't enforced. There are committee members that have missed multiple meetings. But they are still part of the committee on paper. We have unenforced rules	3,20
38	How does it make us feel? It's disrespectful and undermining to us as the LFA. If you want people to volunteer you should give them the resources they need. It disrespects the local community	5,67
39	That does affect how good we are at monitoring and evaluation. It links to the fact we don't have enough people, and we are doing multiple jobs. And it links back to not getting paid. You don't do things properly when you don't get paid. And you cannot force or put pressure on volunteers to do it	4,130
40	There is communication over telephone. But there is nothing binding them	4,72
41	There is supposed to be security, but it's a challenge on its own. There are a lot of challenges. Remember the poles were destroyed many times last season. Security is a challenge. The municipality is a challenge	7,56
42	We struggle with liaising with stakeholders. We do not overcome the constraints. We do not have very good relations with stakeholders. They have issues with pride and ego	7,83
43	We think that SAFA regulations are important. Someone should be in charge of making sure we comply. That is why we have a discipline committee	1,64
44	SAFA should provide documentation for each level of football. Instead of one size fits all	3,75
45	How do we know if we are developing the community? Increased level of skills. Capacity building and the transfer of skills	1,54

46	If you look at these rules, they are made for professional clubs. For people who are employed. The constitution does not assist us. It binds us. Is it a must that we need to follow the constitution at this level? We should have a policy of our own. Make is simple, and make it work for here. To apply to amateur football	5,97
-----------	--	------

Appendix 11: Workshop Review Questionnaire Participant Responses

<u>WORKSHOP CONTENT (Poor (1) to Excellent (5))</u>	
1. I was well informed about the objectives of this workshop	• 5,5,5,4
2. This workshop lived up to my expectations.	• 5,5,5,5
3. The content is relevant to my role in the LFA.	• 5,5,5,5
<u>WORKSHOP DESIGN</u>	
4. The workshop objectives were clear to me.	• 5,5,5,4
5. The workshop activities stimulated my learning.	• 5,5,5,5
6. The activities in this workshop gave me sufficient practice and feedback.	• 5,5,4,5
7. The difficulty level of this workshop was appropriate.	• 5,5,4,5
8. The pace of this workshop was appropriate.	• 5,5,5,4
<u>WORKSHOP INSTRUCTOR (FACILITATOR)</u>	
9. The instructor was well prepared.	• 5,5,5,5

10. The instructor was helpful.	<ul style="list-style-type: none"> • 5,5,5,5
<u>WORKSHOP RESULTS</u>	
11. I accomplished the objectives of this workshop.	<ul style="list-style-type: none"> • 5,5,4,5
12. I will be able to use what I learned in this workshop.	<ul style="list-style-type: none"> • 5,5,5,4
13. The workshop was a good way for me to learn this content.	<ul style="list-style-type: none"> • 5,5,5,5
<u>WORKSHOP REVIEW (OPEN QUESTIONS)</u>	
14. How would you improve this workshop?	<ul style="list-style-type: none"> • Make workshop activities more stimulating • None • Improve the tests used in the workshop. Add more video to the workshop.
15. What other improvements would you recommend in this workshop?	<ul style="list-style-type: none"> • Include other leaders like coaches and managers in analysis to provide an opportunity to learn more about the LFA. • None • To have an overhead projector in order for the workshop to be more efficient.

	<ul style="list-style-type: none"> • None
<p>16. What is least valuable about this workshop?</p>	<ul style="list-style-type: none"> • None • None • None • At times, the lack of direction in conversation leads to digressions from the point at hand. It is challenging to stay on topic which may result in sessions being longer than necessary.
<p>17. What is most valuable about this workshop?</p>	<ul style="list-style-type: none"> • To learn more about our jobs as leaders within the LFA and what rules and strategies we must take moving forward. Also, the importance of gaining more skills. • The provided information by the instructor was most valuable as well as how we all engaged in the topics or arguments of the workshop. • It has managed to provide solutions for most of the challenges of the LFA. It was an exchange of ideas, inclusive and transparent. • It offers those who are not on certain committees a chance to learn about the responsibilities of the other standing committees and how they are able to complete tasks despite the constraints they face.

18. Any other comments

- Thank you for the workshop
- This workshop will help me to understand the work that the LFA does, and also to differentiate between the role of the club and the LFA. It was a good and most enjoyable workshop I have ever attended. Everything was clear from beginning to end.
- The approach adopted for these workshops was informative and produced positive output for reflection of the LFA.
- The researcher was able to explain complex notions related to CWA very clearly and in an easy to understand manner which was helpful moving forward. Also, the researcher's experience as an LFA member was vital as this allowed them to facilitate discussion regularly.

At Nelson Mandela's memorial service in Soweto, Barack Obama said this "There is a word in South Africa – Ubuntu – that describes his greatest gift: his recognition that we are all bound together in ways that can be invisible to the eye; that there is a oneness to humanity; that we achieve ourselves by sharing ourselves with others, and caring for those around us."