

Business Research

An Illustrative Guide
to Practical Methodological
Applications in
Selected Case Studies

Edited by
Pieter W. Buys
Merwe Oberholzer

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FOREWORD

We are living in the era of the rise of the scholarly practitioner. Never before in the history of business education, research and impact has the practitioner devoted to the science of business been as valued or as uniquely positioned to make a difference in solving the sticky, wicked problems and grand challenges of business. Over the last twenty years, business researchers and practitioners have joined forces to collaborate in Engaged Scholarship in which multiple key stakeholders (researchers, users, clients, sponsors, practitioners) collaborate to understand and address an important, complex problem/opportunity. This creates a shift from business research designed to build theory to business research—techniques, methods, and paradigms—designed to create impact with novel, innovative solutions that generate knowledge that informs practice and research equally.

A key shift in the paradigm surrounding this Engaged Scholarship is the recognition that practitioners have unique access to people, data, insights, and areas of inquiry often not available to the academic. Moreover, researchers and practitioners alike have come to realize that context matters—and rich, complex, multi-dimensional contexts matter most. The rapid, continuous changes in technology, people, processes, systems, and environments yield a level of complexity that puts unprecedented pressure on sustainable business practices, profitability, and growth. Without a systematic diagnosis of the problem domain, robust design for the

solution domain, and guided emergent evolution of innovative products, services, systems, and processes, every business will decay and fail to compete and win in the market today.

In my research with my colleagues Grandon Gill and Moez Limayem, we examined the need to create the Informing Business School. We found that a business school intent on impact and relevance needed to create bi-directional, intentional informing paths between businesses, faculty, students, and the body of knowledge. Our evidence demonstrated that many of the strongest ties that improve impact occur when business informs faculty and when students (particularly at the graduate level) inform knowledge—the essence of engaged scholarship. My research with my colleague Alan Hevner recognizes that the most challenging business problems must often be attacked without a clear understanding of the solution domain—where in fact, the researcher-practitioner team does not know the solution until they co-invent it. These observations are the essence of pragmatic and rigorous scientific explorations needed for the most interesting and pressing challenges in business today.

The authors in this book offer the reader—practitioner and scholar alike—evidence of the paradigms, methods, and principles that are fundamental to business research with impact. And they demonstrate the impact through the exemplar studies, outcomes, cases, and vignettes that allow the reader to not only capture the knowledge of what to do but also how to do robust evidence-based research with the highest probability of impact. These researchers make significant contributions to our knowledge and offer a path for the unique partnering and collaboration of students, academics, and practitioners to choose to become collectively our scholarly practitioners. I am convinced that this is the future of business and will define the winners in the most complex, rapidly evolving, technology-transformative era ever in business.

My very best on your journey. I encourage you to learn and practice these approaches. Business innovation will not happen by accident. Let us make it happen by design!

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CONTENTS

1	Introduction	1
	Pieter W. Buys and Merwe Oberholzer	
1	<i>Background</i>	1
2	<i>Contextualization</i>	2
3	<i>Research Paradigms</i>	3
4	<i>Objectives</i>	4
4.1	<i>Theme 1: Positivism</i>	4
4.2	<i>Theme 2: Post-Positivism</i>	5
4.3	<i>Theme 3: Interpretivism</i>	7
4.4	<i>Theme 4: Critical Theory</i>	7
4.5	<i>Theme 5: Pragmatism</i>	8
5	<i>Closing</i>	9
	<i>References</i>	10
2	A Roadmap to Business Research	11
	Merwe Oberholzer and Pieter W. Buys	
1	<i>Introduction</i>	11
2	<i>The Concept of Research</i>	12
2.1	<i>Research Defined</i>	12
2.2	<i>Systematic Process</i>	14
2.3	<i>Contribution</i>	16
2.4	<i>What Research is not</i>	16
3	<i>Research Demarcation: The Three-World-Framework</i>	17

4	<i>The Conceptual Framework of the Research Process</i>	19
4.1	<i>Introduction</i>	19
4.2	<i>Research Problem (ProDEC)</i>	21
4.3	<i>Research Design (ProDEC)</i>	23
4.4	<i>Research Evidence (ProDEC)</i>	33
4.5	<i>Research Conclusion (ProDEC)</i>	35
5	<i>Summary and Map</i>	35
5.1	<i>Roadmap</i>	35
5.2	<i>Layout of Essays</i>	35
6	<i>Closing</i>	37
	<i>References</i>	38
3	The Effect of the Adoption of International Financial Reporting Standards on Foreign Portfolio Investment in Africa	41
	Matthew Omotoso, Merwe Oberholzer, and Danie Schutte	
1	<i>Introduction</i>	41
2	<i>Research Problem</i>	43
3	<i>Research Design</i>	44
3.1	<i>Introduction</i>	44
3.2	<i>Research Paradigmatic: Positivism</i>	45
3.3	<i>Research Approach: Deductive Reasoning</i>	48
3.4	<i>Theory: Decision-Usefulness Theory</i>	49
3.5	<i>Methodological Choice: Quantitative Research</i>	51
3.6	<i>Strategy: Ex Post Facto</i>	52
3.7	<i>Time Horizon: Longitudinal Design</i>	53
3.8	<i>Techniques and Procedures</i>	53
4	<i>Research Evidence</i>	56
5	<i>Research Conclusion</i>	56
6	<i>Concluding Remarks on the Research Process</i>	57
	<i>References</i>	58
4	Determining the Impact of Different Forms of Stationarity on Financial Time Series Analysis	61
	Jan van Greunen and André Heymans	
1	<i>Introduction</i>	61
2	<i>Research Problem and Research Question</i>	64
3	<i>Research Design</i>	65
3.1	<i>Philosophies</i>	65
3.2	<i>Research Approach</i>	66

3.3	<i>Choice of Methodology</i>	67
3.4	<i>Research Strategy</i>	68
3.5	<i>Decision of Time Horizons</i>	68
3.6	<i>Research Techniques</i>	69
4	<i>Research Evidence</i>	73
5	<i>Conclusion</i>	74
6	<i>Practical Experience/Issues</i>	74
	<i>References</i>	75
5	Measuring the Relationship Between Intraday Returns, Volatility Spillovers, and Market Beta During Financial Distress	77
	André Heymans and Wayne Brewer	
1	<i>Introduction</i>	77
2	<i>Research Problem and Research Question</i>	80
3	<i>Research Design</i>	80
3.1	<i>Research Philosophy</i>	81
3.2	<i>Research Approach</i>	82
3.3	<i>Choice of Methodology</i>	82
3.4	<i>Research Strategy</i>	83
3.5	<i>Decision of Time Horizons</i>	83
3.6	<i>Research Techniques</i>	84
4	<i>Research Evidence</i>	89
5	<i>Conclusion</i>	95
6	<i>Practical Experience/Issues</i>	96
	<i>References</i>	96
6	The Relationship Between the Forward and the Realized Spot Exchange Rate in South Africa	99
	Chris van Heerden, André Heymans, and Paul Styger	
1	<i>Introduction</i>	99
2	<i>Research Problem and Research Question</i>	102
3	<i>Research Design</i>	103
3.1	<i>Research Philosophy</i>	103
3.2	<i>Research Approach</i>	105
3.3	<i>Choice of Methodology</i>	106
3.4	<i>Research Strategy</i>	107
3.5	<i>Decision of Time Horizons</i>	107
3.6	<i>Research Techniques</i>	107
4	<i>Research Evidence</i>	111

5	<i>Conclusion</i>	112
6	<i>Practical Experience/Issues</i>	113
	<i>References</i>	114
7	Policy Implementation of Credit Management at Selected South African Universities of Technology	117
	Merwe Oberholzer, Johannes Maseko, and Sanlie Middelberg	
1	<i>Introduction</i>	117
2	<i>Background of the Study</i>	119
3	<i>Research Problem and Objectives</i>	121
4	<i>Research Design</i>	123
4.1	<i>Underlying Sociological Paradigms</i>	123
4.2	<i>Inductive and Deductive Reasoning with Triangulation</i>	123
4.3	<i>Mixed Method</i>	126
4.4	<i>Data, Data Collection, and Analysis</i>	126
5	<i>Research Evidence</i>	129
5.1	<i>Qualitative Data (Archival Research)</i>	129
5.2	<i>Quantitative Data (Survey)</i>	130
6	<i>Research Conclusion</i>	132
7	<i>Concluding Remarks on the Research Process</i>	133
	<i>References</i>	134
8	Analyzing White Maize Hedging Strategies in South Africa	137
	Frans Dreyer, André Heymans, and Chris van Heerden	
1	<i>Introduction</i>	137
2	<i>Research Problem</i>	140
3	<i>Research Question and Objectives</i>	141
4	<i>Research Design</i>	142
4.1	<i>Philosophies</i>	143
4.2	<i>Research Approach</i>	144
4.3	<i>Strategy and Choices</i>	146
4.4	<i>Data and Data Collection</i>	146
5	<i>Research Evidence</i>	150
5.1	<i>Percentile Ranking and Cluster Analysis Results</i>	150
5.2	<i>Hedging Strategy Results—The Filter Model</i>	151

6	<i>Research Conclusion</i>	151
7	<i>Concluding Remarks on the Research Process</i>	152
	<i>References</i>	154
9	Developing a Water Disclosure Index: An Integrative Perspective	157
	Merwe Oberholzer, Martin Botha, and Sanlie Middelberg	
1	<i>Introduction</i>	157
2	<i>Background</i>	159
3	<i>Research Problem and Objectives</i>	160
4	<i>Research Design</i>	162
4.1	<i>Research Philosophy</i>	162
4.2	<i>Research Approach</i>	164
4.3	<i>Research Strategy</i>	167
4.4	<i>Research (Data) Design</i>	168
4.5	<i>Data Collection</i>	169
4.6	<i>Data Analysis</i>	171
5	<i>Research Evidence</i>	172
6	<i>Research Conclusion</i>	174
7	<i>Concluding Remarks on the Research Process</i>	175
	<i>References</i>	175
10	Perceptions of School Management Teams on the Influence of Instructional Leadership on Accounting Learner Performance in Secondary Schools	181
	Lilian Nwosu, Martha Matashu, Tom Assan, and Danie Schutte	
1	<i>Introduction</i>	181
2	<i>Background of the Study</i>	183
2.1	<i>Research Problem and Objective</i>	185
2.2	<i>Research Paradigm</i>	185
2.3	<i>Philosophical Assumption in the Pragmatic Research Paradigm</i>	187
2.4	<i>Research Approach</i>	189
3	<i>Research Design</i>	189
3.1	<i>Research Techniques and Procedures</i>	191
4	<i>Research Evidence</i>	194

5	<i>Research Conclusion</i>	199
6	<i>Concluding Remarks on the Research Process</i>	200
	<i>References</i>	200
11	Using Interpretive Phenomenology to Understand the Tax Compliance Lived Experiences of Small Business Owners	205
	Mphagahlele Ndlovu and Danie Schutte	
1	<i>Introduction</i>	205
2	<i>Research Problem and Objectives</i>	206
3	<i>Research Design</i>	207
3.1	<i>Philosophies</i>	207
3.2	<i>Research Approach</i>	209
3.3	<i>Data Collection</i>	211
3.4	<i>Data Analysis</i>	214
4	<i>Research Evidence</i>	218
5	<i>Research Conclusion</i>	220
6	<i>Concluding Remarks on the Research Process</i>	220
	<i>References</i>	221
12	Utilising an In-Depth Qualitative Approach in a Non-western Context: Exploring the Demands and Resources of First-Year Students from the Perspectives of Support Structures at a Peri-Urban University Campus	225
	Karina Mostert and Carlien Kahl	
1	<i>Introduction</i>	225
2	<i>Theoretical Underpinnings</i>	227
3	<i>Aims and Objectives</i>	228
4	<i>Practical Insights on Conducting Qualitative Research</i>	228
4.1	<i>Planning Research: Designing and Preparing an In-Depth Qualitative Research Study</i>	229
4.2	<i>Executing Research: Data Collection and Fieldwork</i>	233
4.3	<i>Conducting Analysis: Data Analysis and Reporting the Results</i>	241
4.4	<i>Disseminating Findings: Practical Research Outputs and Share Results with Stakeholders</i>	243
5	<i>Conclusion</i>	245
	<i>References</i>	246

13	The Legitimacy Predicament of Current-Day Accounting Theory	251
	Pieter W. Buys	
1	<i>Background</i>	251
2	<i>Perspectives on Accounting</i>	252
3	<i>Research Problem and Objectives</i>	253
4	<i>Research Design</i>	254
	4.1 <i>A Reflective Approach to Accounting Research</i>	254
	4.2 <i>Paradigm Perspectives</i>	255
	4.3 <i>Research Approach</i>	256
5	<i>Research Evidence</i>	257
	5.1 <i>Ethical Considerations</i>	257
	5.2 <i>Accounting Philosophy</i>	258
	5.3 <i>The Value Concept</i>	259
	5.4 <i>Decision-Usefulness</i>	260
6	<i>Research Conclusion</i>	262
7	<i>Concluding Remarks on the Research Process</i>	263
	<i>References</i>	264
14	A Case Study Approach to Develop a Competitive Strategy for a Selected Automotive Distribution Company in Preparation for Saudi Vision 2030	267
	Abdulaziz Ahmadani, Sanlie Middelberg, and Merwe Oberholzer	
1	<i>Introduction</i>	267
2	<i>Background of the Study</i>	269
3	<i>Research Problem and Objectives</i>	270
4	<i>Research Design</i>	271
	4.1 <i>Philosophies</i>	272
	4.2 <i>Conceptual Framework</i>	272
	4.3 <i>Case Study Approach</i>	274
	4.4 <i>Sequential Mixed Method and Triangulation</i>	275
	4.5 <i>Data, Data Collection, and Analysis</i>	275
5	<i>Research Evidence</i>	281
	5.1 <i>Qualitative Data Collection (Interviews)</i>	281
6	<i>Research Conclusion</i>	283
7	<i>Concluding Remarks on the Research Process</i>	285
	<i>References</i>	285

15	A Risk-Based Approach to the Acquisition of Electronic Mine Safety Equipment	291
	Rossouw van der Merwe and Johann Holm	
1	<i>Introduction</i>	291
2	<i>Background of the Study</i>	292
2.1	<i>Research Problem and Objectives</i>	294
3	<i>Research Design</i>	296
3.1	<i>Research Philosophy</i>	297
3.2	<i>Research Approach</i>	298
3.3	<i>Research Strategy</i>	299
4	<i>Research Evidence</i>	305
5	<i>Research Conclusion</i>	307
6	<i>Concluding Remarks on the Research Process</i>	310
	<i>References</i>	310
16	Developing a Channeling Framework for Healthcare Service Provider Networks for a Medical Scheme in South Africa	313
	Elbie Ward, Sanlie Middelberg, and Pieter W. Buys	
1	<i>Background</i>	313
2	<i>Introduction of the Study</i>	314
3	<i>Research Problem and Objectives</i>	316
3.1	<i>Introduction</i>	316
3.2	<i>Stakeholder Theory</i>	317
4	<i>Research Design</i>	317
4.1	<i>Methodology</i>	317
4.2	<i>Empirical Study</i>	320
5	<i>Data Collection and Analysis</i>	326
5.1	<i>Diagnosis Phase</i>	326
5.2	<i>Design Phases</i>	327
6	<i>Research Evidence</i>	330
7	<i>Research Conclusion</i>	330
8	<i>Concluding Remarks on the Research Process</i>	331
	<i>References</i>	331

17	Synthesis and Evaluation of Engineering Processes for the Development of Airborne Electronic Equipment	335
	Johann Holm and Danie Viljoen	
	1 <i>Introduction</i>	335
	2 <i>Background of the Study</i>	337
	3 <i>Research Problem and Objectives</i>	339
	4 <i>Research Design</i>	341
	4.1 <i>Research Philosophy</i>	342
	4.2 <i>Research Approach</i>	342
	4.3 <i>Research Strategy</i>	343
	5 <i>Data, Data Collection, and Analysis</i>	345
	6 <i>Research Evidence</i>	351
	7 <i>Research Conclusion</i>	353
	8 <i>Concluding Remarks on the Research Process</i>	355
	<i>References</i>	356
18	The Development of a Growth-Strategy Support Model to Enable Cross-Border Expansion Stratagems	359
	Henco du Plooy and Pieter W. Buys	
	1 <i>Background</i>	359
	2 <i>Introduction to the Study</i>	360
	3 <i>Research Problem and Objectives</i>	361
	3.1 <i>Introduction</i>	361
	3.2 <i>Theoretical Foundation</i>	362
	4 <i>Research Design</i>	365
	4.1 <i>Methodology</i>	365
	4.2 <i>Empirical Design</i>	366
	5 <i>Research Evidence</i>	369
	5.1 <i>Data Sampling</i>	369
	5.2 <i>Data Collection</i>	370
	5.3 <i>Data Analysis</i>	371
	6 <i>Research Conclusion</i>	376
	7 <i>Practical Experiences</i>	377
	<i>References</i>	377
19	Concluding Comments	383
	Pieter W. Buys and Merwe Oberholzer	
	1 <i>Background</i>	383
	2 <i>Summative Observations</i>	384
	2.1 <i>Theme I: Positivism</i>	384

2.2	<i>Theme 2: Post-positivism</i>	385
2.3	<i>Theme 3: Interpretivism</i>	386
2.4	<i>Theme 4: Critical Theory</i>	386
2.5	<i>Theme 5: Pragmatism</i>	386
3	<i>Closing</i>	387
	<i>References</i>	387
	Index	389

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LIST OF FIGURES

Chapter 2

- Fig. 1 Research process: A holistic perspective (*Source* Adapted from Hesse-Biber and Leavy [2011] and Nieuwenhuis [2020]) 15
- Fig. 2 Conceptual research world levels (*Source* Adapted from Mouton [2011]) 17
- Fig. 3 Critical research factors 20
- Fig. 4 Conceptual honeycomb methodology (*Source* Adapted from Wilson [2013]) 24
- Fig. 5 Conceptual research onion methodology (*Source* Adapted from Saunders et al. [2019]) 25
- Fig. 6 Conceptual step methodology (*Source* Adapted from Babbie [2004]) 26

Chapter 3

- Fig. 1 Explicit philosophical perception and approaches adopted for this study (*Source* Adapted from Saunders et al. [2012]) 45

Chapter 7

- Fig. 1 Interrelation between factors influencing credit management performance 122

Chapter 10

Fig. 1	The interconnections of paradigm, designs, and methods (<i>Source</i> Creswell [2014])	187
Fig. 2	Application of the explanatory sequential design in the study (<i>Source</i> Adapted from Creswell [2015])	190
Fig. 3	SMTs view of the nature and scope of instructional leadership	194
Fig. 4	Principals' views on the nature and scope of the influence of instructional leadership	196
Fig. 5	Deputy principals' views of the nature and scope of instructional leadership	197
Fig. 6	HoDs views on the nature and scope of the influence of instructional leadership	198

Chapter 12

Fig. 1	Schematic presentation of theories and concepts to consider and keep in mind for the in-depth relational interview held with structures from the HEI	239
Fig. 2	Diagram depicting the central research question to elicit in-depth relational conversations on first-year study demands	240

Chapter 14

Fig. 1	Conceptual framework	273
Fig. 2	Actor intelligence theory	284

Chapter 15

Fig. 1	System life cycle phases	294
Fig. 2	DSR as a research paradigm (<i>Source</i> Adapted from Hevner [2007])	297
Fig. 3	R&D in the DSR paradigm (<i>Source</i> Adapted from van der Merwe [2014])	300
Fig. 4	Research framework used in this study (<i>Source</i> Holm and van der Merwe [2019b])	303

Chapter 16

Fig. 1	Honeycomb research methodology (<i>Source</i> Adapted from Wilson [2014])	318
Fig. 2	Primary research phases	321

Fig. 3	eADR phases (<i>Source</i> Adapted from Mullarkey and Hevner [2019])	322
Fig. 4	Summary of the application of ADR activities	325
Fig. 5	Conceptual and actual savings due to effective channeling	329

Chapter 17

Fig. 1	An integrated avionics system	338
Fig. 2	DSR in this research paradigm (<i>Source</i> Adapted from Hevner [2007])	341
Fig. 3	Evolution of development framework	346
Fig. 4	High-level life cycle process model as derived from the RTCA/DO-178C analysis	351
Fig. 5	System-level development process model	353

Chapter 18

Fig. 1	SWOT and PESTLE interaction (<i>Source</i> Adapted from Nishada [2012])	364
Fig. 2	ADR stages and principles (<i>Source</i> Adapted from Sein et al. [2011])	367
Fig. 3	The eADR approach (<i>Source</i> Adapted from Mullarkey [2018])	369
Fig. 4	Evolutionary design process (<i>Source</i> Adapted from Sein et al. [2011])	371

LIST OF TABLES

Chapter 2

Table 1	Research paradigm comparison	28
Table 2	Summative paradigm assumptions and research method	30
Table 3	Research methodologies associated with different paradigms	32
Table 4	Difference between quantitative and qualitative research methods	34
Table 5	ProDEC-based roadmap to a conceptual framework	36

Chapter 5

Table 1	Illustrative statistical proxies: Descriptive statistics	88
Table 2	Illustrative statistical proxies: Volatility measures	89
Table 3	AS model results (mean equation)	91
Table 4	AS model results (variance equation)	93

Chapter 7

Table 1	Results of the qualitative investigation	130
---------	--	-----

Chapter 8

Table 1	Data source, available time span, and frequency	148
Table 2	Hedging strategy summary	149

Chapter 9

Table 1	Summary of the water disclosure index (with company performance)	170
Table 2	Mean difference between IR/not IR groups (<i>t</i> -test)	173
Table 3	Spearman's correlation coefficients	173
Table 4	Comparing the entire water disclosure index with other variables	174
Table 5	Results of the Tukey test for the entire water disclosure index	174

Chapter 10

Table 1	Comparison of ontology and epistemological assumptions	188
Table 2	Schools in NMMD	192

Chapter 14

Table 1	Results of the qualitative investigation	280
Table 2	Descriptive analysis of responses per perspective/model	281

Chapter 15

Table 1	Research validation matrix	308
---------	----------------------------	-----

Chapter 16

Table 1	Application of research methodology	319
Table 2	Application of eADR principles	323
Table 3	Diagnosis: Potential improvement	327
Table 4	α -design: Initial improvement expectations	328
Table 5	β -design: Initial improvements	328

Chapter 17

Table 1	Research Validation Matrix for this study	354
---------	---	-----

Chapter 18

Table 1	Application of ADR principles	368
Table 2	Decision-support framework	373
Table 3	PESTLE category weightings	374
Table 4	PESTLE uncertainty score table	375



Introduction

Pieter W. Buys^{id} and *Merwe Oberholzer*^{id}

I BACKGROUND

The fluidity and dynamicity of modern society cannot be disputed, and the rate of technological innovation is such that even attempting to keep abreast borders on the impossible. The contemporary business environment is not exempt from this roller-coaster ride, resulting in business managers facing complex situations requiring creative management solutions. It may happen that those managers, desirous of solving some of these challenges, embark on their research initiative peculiar to their unique circumstances.

Such solutions may take on various forms, ranging from a desire to develop a model or framework to solve a specific business problem to

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a requirement to understand a particular business scenario better. Business managers are typically not particularly interested in *scientific research* and *academic careers* (Myers, 2020). Nevertheless, to conduct proper research, reach valid conclusions and develop pragmatic business solutions requires a solid and rigorous foundation for such research (Saunders et al., 2019). This brings us to the question of identifying and defining an appropriate research approach in a specific business scenario.

2 CONTEXTUALIZATION

This book focuses on research methodologies that apply to business studies, particularly on research projects with a dual purpose. Firstly, researchers may be desirous of completing post-graduate research within a managerial science discipline. Secondly, the research efforts aim to support a particular managerial need in practice. In this context, *business researchers* are primarily taken as managers in the industry. Still, other interested parties to pragmatic business research approaches in context may also find value herein. As such, the scope of *business management* is quite broad and may be applied across multiple industries and managerial disciplines.

Business research (-studies) is considered part of the social sciences, and research within this context is arguably a social scientific activity. When non-academic (or novice) business researchers embark on their research road, they soon realize that many authors and teachers of research methodology have diverse backgrounds, perspectives, and preferred methods. Within the myriad of available approaches to business research, many approaches may not be the best in the managers' specific scenario. A problem facing the business researcher is, therefore, how to identify and select an appropriate research methodology in context and how to properly execute the research from *cradle-to-grave*.

Many top-quality and rigorous research methodologies texts are available within the broader business research domain, and while some may be considered generic, others may be more discipline-specific. Several are used for illustrative purposes in Chapter 2. This book aims to simplify proper business research for industry managers that do not have the time or inclination to *research* valid business research methodologies before embarking on their actual research. The aim is not to substitute, replace, or even contradict the mentioned business research methodology books but rather to supplement such texts and, in a sense, validate many of

the approaches explained therein. However, this book aims to serve as a research roadmap with illustrated examples of applied business research methodologies. It is up to the individual business researcher(s) to decide and feel comfortable knowing that their research project is academically sound.

3 RESEARCH PARADIGMS

A systematic and rigorous research roadmap can empower business researchers to understand the relevance and importance of academically sound business research. Such research can provide practical solutions to business problems (Voxco, 2022). In doing so, some attention is given to narrowing the gap between *theory* and *practice*, which requires that fundamentals of scientific research be adhered to and keep a delicate balance between providing a practice-friendly guide to pragmatic and academically sound business research. For purposes hereof, we categorized business research into five general themes as follows:

1. **Positivism** is a research paradigm where observations and experiments obtain knowledge (Rahi, 2017). Features of this paradigm include researcher objectivity, generalizable findings, quantitative data analysis, and only one actual reality.
2. **Post-positivism** aims to uncover the meaning of reality. However, as opposed to positivism, it does not provide exact answers, and its focus is not to generalize findings but to search for evidence in terms of phenomena (Nieuwenhuis, 2020).
3. **Interpretivism** focuses on human action and is descriptive, subjective, and explorative, with limited generalizability of its findings (Kekeya, 2019).
4. **Critical theory** falls between interpretivism and positivism and aims to understand reality better (Kekeya, 2019).
5. **Pragmatism** focuses on real-world problems and is guided by practical considerations, not theoretical ones (Kivunaj & Kuyini, 2017). As an extension of pragmatism, design science creates artifacts for innovative solutions to real-world problems (Vom Brocke et al., 2020).

It should be noted that very seldom is a research paradigm solely the domain of a specific research project. It is more likely that a research project would encompass aspects of multiple paradigm domains.

4 OBJECTIVES

The primary objective is, therefore, to guide business researchers in identifying, defining, and applying academically sound research methodologies that will enable them to design and execute effective research that answers their specific needs.

In attaining the above objective, two secondary goals were set out, as follows:

- The first component is to unpack and simplify critical aspects of valid business research methodologies (Chapter 2). This section aims to provide foundational knowledge in understanding and evaluating business research methodologies and ultimately provide a roadmap to guide (novice) business researchers in attaining their goals.
- The second component is the independent but complementary examples of completed business research projects (Chapters 3 to 18). Although the application and research fields range from manufacturing and engineering to public sector services and medical schemes, the common thread is to relay the applied methodologies and research experiences.

The methodological examples (essays) presented herein are allocated to these themes by their most dominant research paradigm, as follows.

4.1 Theme 1: Positivism

Essay 1 (*Chapter 3: The Effect of the Adoption of International Financial Reporting Standards on Foreign Portfolio Investment in Africa*) used regression analysis and found a positive association between countries adopting International Financial Reporting Standards (IFRS) and foreign portfolio investment (FPI) in Africa. The results can be generalized from the *quantitative* data analysis, IFRS, and FPI (USD); the evidence collected indicated that IFRS adoption in an African country promotes that country's FPI inflows.

Essay 2 (*Chapter 4: Determining the Impact of Different Forms of Stationarity on Financial Time Series Analysis*) determined the impact of different forms of stationarity on financial time series analysis. Empirical data for this *quantitative* research was obtained from daily price observations retrieved from the JSE. The findings are generalized: how a particular time series should be rendered, stationery must be led by the statistical properties of the data and not by blindly following popular techniques.

Essay 3 (*Chapter 5: Measuring the Relationship Between Intraday Returns, Volatility Spillovers, and Market Beta during financial distress*) measured the relationship between intraday returns, volatility spillovers, and market Beta during financial distress. The study *quantitatively* tested for a derivative of uncorrelated stocks by determining whether reducing volatility spillover effects leads to lower portfolio risk. The study results can be generalized that it is strongly supported to include a volatility spillover measure when constructing a portfolio based on past price information.

Essay 4 (*Chapter 6: The Relationship Between the Forward and the Realized Spot Exchange Rate in South Africa*) investigated the exchange rate puzzle following an experimental research strategy to prove that the puzzle is a pseudo mystery. The exchange rate puzzle refers to the phenomenon that the forward exchange rate differs substantially from the realized future spot exchange rate. Since market participants use the current forward exchange rate to make decisions about future exchange rate changes, significant differences between the current forward exchange rate and the realized spot rate could lead to substantial losses. Two hypotheses derived from the exchange rate model were *quantitatively* tested and deductively interpreted.

4.2 Theme 2: Post-Positivism

Essay 5 (*Chapter 7: Policy Implementation of Credit Management at Selected South African Universities of Technology*) investigated the policy implementation of credit management at selected South African Universities of Technology. *Mixed methods* were adopted to collect and analyze

qualitative and quantitative data. The former are archival documents, universities' student credit management policies, and annual audited financial statements. The latter is a questionnaire completed by 1 382 senior students to test their perceptions of debt, universities' credit management policies, and personal financial management.

Essay 6 (*Chapter 8: Analyzing White Maize Hedging Strategies in South Africa*) analyzed white maize strategies in South Africa utilizing two phases in a *mixed-methods* approach. Firstly, was to determine from qualitative data why maize producers are reluctant to use derivative contracts to hedge their price risk. While secondly, to calculate the profitability of different hedging strategies currently employed by market participants in the white maize derivatives market.

Essay 7 (*Chapter 9: Developing a Water Disclosure Index: An Integrative Perspective*) collected data from 49 companies from three indices, the JSE, ASX, and DJGSI, to develop a water disclosure index. A *mixed-methods* research strategy was utilized, as qualitative and quantitative data were collected simultaneously from the integrated, sustainability, or environmental reports. All the qualitative data was then quantified. Further statistical analysis was done to compare water disclosure quality between integrated reporting (IR) and traditional stand-alone reporting and, secondly, between the three indices.

Essay 8 (*Chapter 10: Perceptions of School Management Teams on the Influence of Instructional Leadership on Accounting Learner Performance in Secondary Schools*) evaluated the roles of instructional leadership in enhancing accounting learners' performance. A *mixed-methods* research strategy was utilized, as qualitative and quantitative data were collected simultaneously from school management teams (SMT) and accounting educators in selected secondary schools. A total of 61 accounting educators and 180 SMTs were utilized in the quantitative phase of the study. At the same time, saturation was reached to collect data from interviews with accounting educators and SMTs for the qualitative phase of the study. After the empirical analyses, improved instructional leadership roles of SMTs and educators' frameworks were developed.

4.3 Theme 3: Interpretivism¹

Essay 9 (*Chapter 11: Using Interpretive Phenomenology to Understand the Tax Compliance Lived Experiences of Small Business Owners*) aimed to understand small businesses' day-to-day experiences and the reasons responsible for tax compliance. The study employed a *qualitative* research approach following Heidegger's interpretive phenomenological design. Semi-structured interviews were used, and the phenomenological results were presented thematically following guidelines offered by Van Manen.

4.4 Theme 4: Critical Theory

Essay 10 (*Chapter 12: Utilizing an In-Depth Qualitative Approach in a Non-Western Context: Exploring the Demands and Resources of First-Year Students from the Perspectives of Support Structures at a Peri-Urban University Campus*) explored first-year students' study demands and resources in transition. The backdrop is that universities enroll many first-generation students from socio-economic deprivation and poverty in a developing country such as South Africa. The researchers selected an interpretive philosophy to access participants' *socially* constructed, diverse, subjective experiences. A qualitative research methodology strategically accessed phenomenologically informed descriptions and interpretations. Qualitative data was collected from in-depth interviews and inductively analyzed using thematic analysis facilitated by ATLAS.ti.

Essay 11 (*Chapter 13: The Legitimacy Predicament of Current-Day Accounting Theory*) investigated the legitimacy predicament of current-day accounting theory. This research was performed within the background that high levels of volatility, uncertainty, complexity, and ambiguity prevalent in modern *society* present unique challenges for contemporary organizations. The pressure to control costs and ensure responsible resource utilization while meeting diverse stakeholder requirements often misaligned accounting information. The critical interest research approach has developed into meta-disciplines such as philosophy and ethics. Since

¹ Although only one example of interpretivism is provided, several other essays also provide some evidentiary examples of interpretive aspects, i.e., the essays in *Theme 2: Post-positivism* as well as essays 10, 12, 14, and 16. This reiterates the fact that, in many cases, hybrid-research methodologies are valid—depending on the context and objective.

this research endeavored to reflect on the legitimacy of contemporary accounting, it is positioned in a critical framework with some aspects of interpretivism.

4.5 *Theme 5: Pragmatism*

Essay 12 (*Chapter 14: A Case Study Approach to Develop a Competitive Strategy for a Selected Automotive Distribution Company in Preparation for Saudi Vision 2030*) developed a competitive strategy for an automotive distribution company preparing for Saudi Vision 2030. Following a sequential mixed-methods design, the study was nested in a pragmatic paradigm. Qualitative data was collected through semi-structured face-to-face interviews with 32 senior employees. From the results of the interviews, a questionnaire was designed to collect quantitative data from 205 case study employees. The actor-network theory and a combination of three strategic models were central to the study. In-depth knowledge was obtained about the phenomenon as new strategic insight into competitiveness within the Saudi Vision 2030 was obtained.

Essay 13 (*Chapter 15: A Risk-Based Approach to the Acquisition of Electronic Mine Safety Equipment*) produced an artifact for a risk-based approach to acquiring electronic mine safety equipment. This study addresses a real-world problem that uses pragmatic system research and development methods. A methodology was required to perform risk analysis and mitigation over a safety system's entire life cycle while considering practical constraints. As a result, design science research was applied to balance real-world requirements on one end with grounded theoretical and heuristic methods.

Essay 14 (*Chapter 16: Developing a Channeling Framework for Healthcare Service Provider Networks for a Medical Scheme in South Africa*) developed a channeling framework for healthcare service provider networks for a South African medical scheme. In a case study approach, the research design was based on the Action Design Research (ADR) methodology, prioritizing the guided emergence of the artifact as a research objective. The research aimed to solve a real-life business problem, as no known solution for the research problem was evident at the beginning of the study. ADR provided the stages and principles to address the uncontrolled environment. Secondary data and semi-structured interview data were collected and analyzed. The research was

based on interpretivism as philosophy, which is more inclusive and accepts more viewpoints—an essential requirement if the outcome is unknown and the research problem involves many different stakeholders.

Essay 15 (*Chapter 17: Synthesis and Evaluation of Engineering Processes for the Development of Airborne Electronic Equipment*) developed an airborne electronic system development process and controls in a defense environment. This research, which falls mainly in the pragmatic category, was conducted using Action Design Research (ADR), Design Science Research (DSR), and Quality Research Management (QRM) for quality assurance. Existing company processes, external validated processes from literature, and fundamentally grounded system principles were used to design an improved development-process artifact and its associated controls.

Essay 16 (*Chapter 18: The Development of a Growth-Strategy Support Model to Enable Cross-Border Expansion Stratagems*) developed a growth-strategy support model to enable cross-border expansion stratagems. An elaborated Action Design Research (eADR)-based research approach was selected to create the model to aid an organization in developing a growth strategy for cross-border operations in Mozambique. The literature solidified the foundation for a better understanding of Mozambique’s potential challenges (and opportunities). The knowledge acquired from the literature study was the foundation for the empirical research. The study embraced a realism framework due to available scientific and management tools, thus providing a positivistic dimension in the identification, analysis, and artifact-creation process. Furthermore, selected participants’ opinions and personal experiences during the data-gathering process and their interpretation provided a post-positivistic dimension.

5 CLOSING

This short introductory chapter aimed to provide the context for pragmatic business research. The book’s objective is to give managers in the industry, who may not necessarily have extensive and formal academic research training but are desirous of conducting scientifically rigorous research, some guidance in business research. This is primarily targeted at scenarios where a manager is faced with a business problem that needs to be addressed. As such, an attempt is made to simplify business research’s complexity and provide some guiding examples to assist herein.

It must be noted that the included and illustrative essays (including the methodological selections, research execution, and conclusions) are the results of independent, completed, post-graduate research projects and are based on the experiences of each specific researcher. Other researchers in similar situations may not have the same experiences. Nevertheless, the examples should add some value to business researchers.

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A Roadmap to Business Research

Merwe Oberholzer^{id} and *Pieter W. Buys*^{id}

1 INTRODUCTION

The previous chapter provided some introductory guidance into the objective of this book, which aims to provide business researchers with enough academically sound knowledge to navigate the complex maze of *scientific* business research. This chapter seeks to constitute a roadmap or framework to guide business researchers in contextualizing and planning their research efforts and guide the execution thereof. It is not intended to prescribe a specific research approach (methodology) but rather to illustrate various valid research concepts and techniques. As Delen and Zolbanin (2018) suggest, this variety will aid that business researchers should “add other tools besides a hammer to their toolkit, so that not

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every problem looks like a nail.” In doing so, the chapter is divided into the following sections.

- Section 2 elucidates the *research concept* and will be achieved by defining research, unpacking the research process, explaining the research contribution aspect, and clarifying what research is not.
- Section 3 tackles the *philosophical levels* in which research can occur and elucidates the level(s) most applicable in business research.
- Section 4 explains the research process’ *conceptual framework* and is divided into four parts (per Mouton’s (1996) acronym *ProDEC*), encompassing the research problem, research design, empirical evidence, and conclusion as essential elements in the overall research process.
- Section 5 brings the above into a *conceptual roadmap* to guide business researchers and will serve as the foundation upon which the illustrated examples (essays) will be based.

2 THE CONCEPT OF RESEARCH

This section clarifies the research concept. The definition of research is broken into two main parts, i.e., the research process and the contribution. This section also demonstrates what research is not.

2.1 *Research Defined*

It is quite a task to come up with a singular, universal definition of the concept of research—the following serve as examples hereto:

- Pandey and Pandey (2015) state that the term research comprises two concepts, i.e., re + search, meaning to search again, alluding to the systematic investigation to acquire new knowledge or expand upon existing knowledge.
- Myers (2020) defines research as an original search undertaken to add or create new knowledge and understanding in a specific discipline.
- The Department of Education and Training at Western Sydney University (2020) believes that research entails creatively creating

new knowledge or using existing knowledge to generate new ideas, methodologies, and understanding.

- Lexico.com (2021) defines research as the systematic inquiry and study of materials and sources to establish facts and reach new conclusions.
- Collins (2021) believes that research involves studying something to discover its facts.

From the above, it is apparent that research consists of two main constituents. Firstly, it entails a systematic investigative process, and secondly, it should lead to new facts or knowledge. Therefore, a concise understanding of the research concept entails that it is a:

... systematic investigation to reveal new knowledge.

Also relevant in context is the focus on business research. Voxco (2022) considers business research as gathering and leveraging data on all business areas to promote profit maximization. It should support managerial decision-making processes while demonstrating sufficient rigor to satisfy both the business client (or practitioner) and the academic requirements. Business research must also be pragmatic¹ and valuable to the industry, be systematic and reveal new knowledge. Therefore, for this book, we define business research as follows:

An academically sound and rigorous investigation into business issues to generate knowledge to support business decision-making.

Finally, much has been said about the gap between *theory* and *practice*. Saunders et al. (2019) argue that practitioners' research focuses on solutions to practical problems and aims to obtain actionable results with beneficial impact. Oppose hereto is that academics focus on theory explanation with the objective of academic publication. Myers (2020) adds that industry practitioners are typically not concerned with academic jargon or the educational value of the research in solving their specific problem. Nevertheless, the fundamental principles of scientific research must be adhered to in order to ensure accurate and practical solutions, resulting

¹ AS illustrated later, it must be noted not every business problem needs to be solved by scientific research.

in a delicate balance to provide a practice-friendly guide to pragmatic and scientifically sound business research.

2.2 *Systematic Process*

As alluded to above, research firstly entails a systematic investigative process to solve a problem. Mouton (2011) identifies two distinctive research phases to solve the problem, i.e., the *research design* and the *research process*. In conceptualizing these phases, the research design phase may be seen as the research's blueprint, while the research process phase represents the systematic execution of the study.

In line herewith, Creswell and Clark (2018) believe that sound research projects consist of (1) a paradigm worldview or beliefs, e.g., the aspects of ontology and epistemology, (2) the theoretical foundation upon which the research is to be based, (3) the methodology, e.g., the ethnography, experimentation, and mixed-method, and (4) the applied methods of data collection, analysis, and reporting. Hence, like Mouton's perspective, Creswell and Clark incorporate design and execution aspects in the research's investigative processes.

An adaptation from Hesse-Biber and Leavy (2011) and Nieuwenhuis (2020) is presented in Fig. 1 to illustrate a holistic flow of the systematic research approach, which contrasts the foundational (academic) aspects on the one side against the research execution on the other side. In context, a research methodology aspect provides an integrative link between these aspects.

From the left, the starting point to systematically solve a research problem begins with considering the research paradigms, philosophies, and theoretical foundation. The research execution is embodied in the various applied methods and techniques on the right, with the research methodology providing the bridge between the left and the right. This concept is confirmed by Kivunja and Kuyini (2017) when stating that

... the methodology articulates the logic and flow of the systematic processes followed in conducting a research project to gain knowledge about a research problem.

Important research-related concepts include research paradigms and philosophies, ontology, epistemology, and theoretical foundations (Abutabenjeh & Jaradat, 2018; Hesse-Biber & Leavy, 2011). A basic

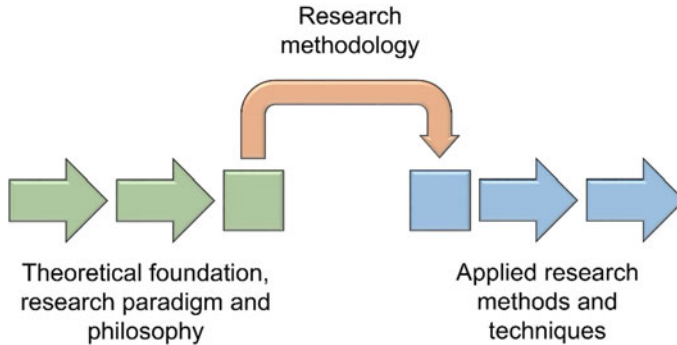


Fig. 1 Research process: A holistic perspective (Source Adapted from Hesse-Biber and Leavy [2011] and Nieuwenhuis [2020])

understanding of these integrated concepts is vital as each impacts the research question's formulation, conceptualization, and execution.

- i. **Research paradigm:** Nieuwenhuis (2020) considers the paradigm as the lens through which the researcher interprets reality. Rehman and Alharthi (2016) believe it represents the belief system with assumptions to describe the researcher's worldview.
 - Herein, we find the concepts of *branches of philosophy* and *philosophical assumptions* as relating to the ontology (the fundamental assumptions about reality) and the epistemology (relationship between the knower and the known) as part of the paradigm (Kekeya, 2019; Rahi, 2017).
- ii. **Theoretical foundation:** The theoretical foundation (theory aspect) reflects existing or current empirically obtained knowledge over time by deductive or inductive data analysis (Kivunja, 2018).

According to Kankam (2019), the difference between paradigms and theories is that the paradigms do not explain anything per se but provide different ways of looking for answers and serve as a framework within which theories may be developed and tested. At the same time, the theory aspect is engaged in offering possible explanations of phenomena.

2.3 *Contribution*

The second component of the research definition focuses on gaining new knowledge, referring to the research contribution. Although business research may not always require quantifying a research contribution, there are times when such a potential contribution must be assessed. For example, when the research project is part of a doctoral study, there is an academic requirement *to contribute something significant and worthwhile to the existing knowledge*. In such cases, the researcher should be guided by the following questions (FindAPhD.com, 2021):

- “What question is the research answering, and why is it important?”
- Why do the research conclusions matter?
- How do the conclusions fit in with the broader discussions in the field?
- What are the limitations of the research?
- How might further discussion of the research question benefit the field?”

Since (academically sound) research is conducted in a theoretical, conceptual frame, its contribution must indicate how the appropriate theory is enriched, enhanced, and refined, or even how a new theory was developed (see further discussion in Sect. 4.3 of the theoretical framework, i.e., deductive, inductive, and abductive reasoning). In short, the research project must lead to something worthwhile, which implies practical value.

2.4 *What Research is not*

Now that the research concept has been explained, it is also important to briefly discuss what is not considered research. It has been stated that research is a systematic investigation to develop knowledge or solutions to a specific issue or problem. In this context, the following research aspects do not entail actual scientific research:

- The comparison of data.
- The collection of data.
- The presentation of data.
- The transfer of facts from one place to another.

- Plagiarism.
- Falsifying data to prove a point.
- Misrepresentation of information.

The first four points are valid research activities within an academically sound research process. Nevertheless, individually and independently, they do not constitute research in itself. In contrast, the last three points are ethically questionable activities and should not form part of any robust research process.

3 RESEARCH DEMARCATION: THE *THREE-WORLD-FRAMEWORK*

Mouton (1996) introduced a basic research framework that exhibits three distinct levels, which conceptually illustrate areas within which research can be conducted (see Fig. 2).

These levels guide our quest to develop an essential roadmap for conducting industry-orientated business research. The business researcher must know which distinct world within the investigation will be targeted. These worlds require distinctive descriptions of the research problem and its demarcation. The following paragraphs will elucidate.

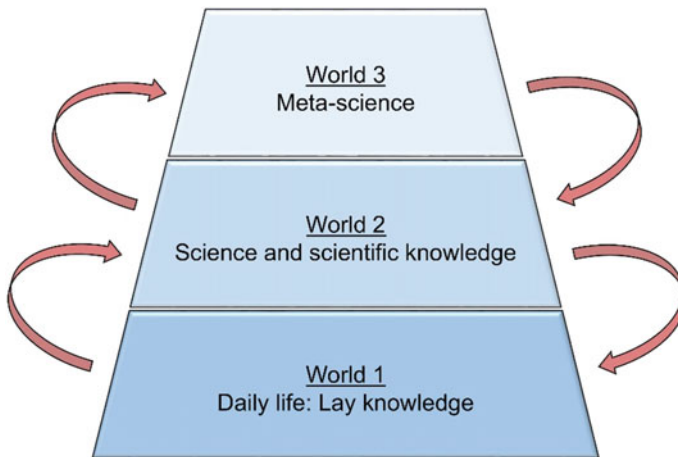


Fig. 2 Conceptual research world levels (Source Adapted from Mouton [2011])

- i. **World 1:** This world level represents the realities and complexities of daily life in which the knowledge to survive is known as *lay knowledge* (Mouton, 2011). Business problems in World 1 may not require contextualizing within a specific theory, which may simplify the process. Examples of business problems at this level include productivity and employee absenteeism concerns, poor organizational and financial performances, ineffective production processes, changing market conditions, financial mismanagement, etc. It is possible that problems of these types *do not need to be researched* but may be solved by management action.

Example : An organization generally experiences poor financial performance. Active management intervention may address this by reducing costs, eliminating wastage, and growing revenues. Nevertheless, business problems identified here may also indicate more unknown root causes, which may be research worthy within the World 2 level.

- ii. **World 2:** This world level represents the world of science and scientific research (Mouton, 2011). Business problems in World 2 are more complex, and the research needs to be contextualized within a theory/theories or conceptual frame. Hence, actual business problems (per the above examples) may be identified and selected in searching for epistemic (truthful knowledge) interest. Most of the illustrative examples in later chapters are examples of real-life business issues—World 1 topics researched in a World 2 context.

Example : Consider the poor financial performance example mentioned above, and assume the responsible manager suspects an unknown root cause of the problem. Although the manager may guess some reasons, management action alone may not be sufficient to provide a solution. The real answer may require identifying and analyzing various factors, weightings, and scenarios. A systematic research approach may better elucidate the issue and offer a possible solution.

- iii. **World 3:** This world level represents the meta-sciences (Mouton, 2011) and becomes applicable when pursuing higher reflection

initiatives within a particular business scenario. World 3 problems that build on World 2 research may not require a theoretical contextualization since it mainly reflects on methodologies and existing knowledge gained by World 2 research. Typical questions at this level may focus on philosophical and methodological issues in context, ethical, and moral concerns in the business and management sciences, and even the effect of historical events on business practices.

Example : Consider the poor financial performance example again from above. Reflections can focus on, among other things, the association between the directors' remuneration and organizational performances. The researcher could consider relevant theories to contextualize phenomena, various research and statistical models applicable in such analysis, or the potential importance, effect, and impact of such relationships.

Furthermore, it may be worth noting that the above world-level perspectives should not be seen in an isolated, silo context. Organizations are complex and non-static systems, resulting in highly agile and dynamic business functions. It is, therefore, perfectly justifiable to approach business research from a multi-world perspective. This implies that when practitioners seek solutions for a problem such as the above poor firm performance example, they may start at a World 1 level by taking action to get a quick answer. This may be followed up into a World 2 research project that will be more in-depth to gain insight into what causes the poor performance. This knowledge may be helpful to take further action, for example, to address the most prominent causes of poor performance. Finally, a World 3 research project may reveal an overarched "big picture" insight into the phenomenon of poor firm performance.

4 THE CONCEPTUAL FRAMEWORK OF THE RESEARCH PROCESS

4.1 Introduction

The research definition specifies a systematic approach, which builds on a defined research problem, possibly summarized in a research question. An appropriate research method is formulated to guide the data

collection, analysis, conclusions, and final reporting. A conceptual framework may serve as the logical conceptualization in approaching a research project. Kivunja (2018) describes such a framework as “...the umbrella term relating to all the concepts and ideas that occupy your mind as you contemplate, plan, implement and conclude...” the research project.

For this book, the primary research process can be summarized as follows:

- Identifying the knowledge gap. This gap reflects in the research problem converted into a question or (if applicable) in context, formulating a research hypothesis.
- Formulating the research objectives should aim to solve the research problem, answer the research question, or (if relevant) test the research hypothesis.
- Formulating the methodology in a full life-cycle context, i.e., from the first foundational concepts through executing the appropriate techniques, conclusions, and presentations.
- Executing the research, including the data gathering and analysis, the verification and validation of the solution, and the final reporting.
- The research conclusion ensures that the research objectives have been met.

Figure 3 conceptualizes the critical research aspects contributing to such a systematic process.



Fig. 3 Critical research factors

Research topics may materialize because of a perceived knowledge gap—discovered through a literature review or practical experiences. In context, the problem statement needs to explain the missing knowledge, summarized in a research question and the objectives. The answering of the question (or reaching the goals) is the contribution, which implies that the *gap* is filled. Finally, the practical value of the research needs to be exposed.

For purposes of this book, the ProDEC acronym (per Mouton, 1996) is used as a definitive guide in explaining the research process, representing the elements² of the research **P**roblem, research **D**esign, empirical **E**vidence, and **C**onclusion. The following sub-sections consider each element, starting with the research problem (Sect. 4.2), followed by the research design (Sect. 4.3). It should be noted that the design phase includes consideration of the research paradigm, philosophy, and theory, as well as the methodology linking these elements to the research method (per Fig. 1). The evidence aspect (Sect. 4.4) revolves around collecting and analyzing the data. However, it also needs to be considered part of the design, i.e., clarifying how the data will be collected and analyzed. The conclusion (Sect. 4.5) revolves primarily around the contextualization of the findings and the practical implications of the research, which should indicate how to solve the predetermined demarcated business problem. Similar to the evidence aspect, the conclusion should also be considered during the design phase, where the researcher should reflect on the importance and potential impact of the findings. Therefore, it may be deduced that the design phase is vital, impacting the project’s effective execution and successful conclusion.

4.2 Research Problem (ProDEC)

As stated, business research requires a problem to be solved, which means a *concise* research problem or question definition is the starting point of the study—often easier said than done.

Example : Assume one wants to investigate the financial performance of publicly listed mining companies. Initially, this seems to be a valid topic. Firstly, the data from publicly listed companies will be readily available.

² Note that although conceptually four distinct elements, in actuality these ProDEC elements are highly integrated.

Secondly, it can be (easily) converted into a research question, e.g., *how do mining companies on Stock Exchange X perform?* However, the issue here is that there might be no underlying problem to be solved. When the researcher completes the research, an answer may reveal that the sample companies' average return on investment is 10%. So, yes, the research question has been answered. But why is this knowledge necessary or important? In other words, does this result answers the so-called "so-what" question?

A helpful way to start formulating the research problem is an exercise to guide the business researchers' thinking processes (so to speak). This may be beneficial to ensure that the research project is sound and well-thought-out.

Example: **I AM STUDYING** ...the profitability of gold mining companies relative to the whole mining sector...,
BECAUSE I WANT TO FIND OUT ...whether their profitability is more volatile relative to other mining companies...,
IN ORDER TO ...gain knowledge about the relative risk of investing in gold mines...,
BY ...following a quantitative approach (deductive reasoning) by statistically analyzing all the mining companies on Stock Exchange X (from 1970 to 2020) ...,
TO DETERMINE ...whether there is a statistically significant difference in the standard deviations of various profitability ratios between gold and other mining companies.

Spending some time formulating the above statements will help business researchers define the research problem properly. The finishing touches are the research question and hypothesis regarding the research problem definition.

- **Research question:** Business researchers, especially *post-graduate* business researchers, often summarize the research problem into a concise research question. The need for a research question is that it may (1) assist in directing researchers toward appropriate literature and (2) provide some guidance in terms of data collection and analysis (Jansen, 2020a), which may then also guide the formulation of detailed objectives.

- **Research hypothesis:** The hypothesis arguably originates in the research question and is often seen as a *suggested solution to the problem*. Pietersen and Maree (2020) believe that the research hypothesis summarizes a researcher's specific ideas regarding the properties of the research variables. Note that a hypothesis is generally for quantitative research and not common in qualitative research. Qualitative research prefers the term *proportions* instead of hypothesis.

4.3 Research Design (ProDEC)

Introduction

The research design objective is to provide a comprehensive roadmap for the research project (Myers, 2020), which will include various components. During such a design, the business researcher must focus on the best way to solve the problem (*Pro*) while being mindful of how the evidence (*E*) will be collected and analyzed, as well as anticipating how the conclusion (*C*) may contribute to the literature (i.e., the body of knowledge).

Various authors use a variety of methodological frameworks to explain their perspectives on research design. Many are academically sound and offer practical value in guiding the business researcher. Similarly, many approaches also have some critiques against them. It is worth noting that various authors also use different terminologies in context. For example, we indicated earlier that Mouton (2011) used the term *research design* to describe the first phase of the research process, while Kivunja (2018) considers *research design* revolving around the conceptual framework. Wilson (2013), in turn, uses the term *research design* to classify different types of studies, e.g., action research, case study, or experimental research, while these research types are considered the research strategy by Saunders et al. (2019) or design methodologies by Davis and Fisher (2018). These examples are valid but illustrate business researchers' confusing maze of academic research. In the following sections, we attempt to provide some contextual guidance herein.

Design Approach

Three well-known methodological approaches to research design are briefly highlighted below, the honeycomb, research onion, and sequential roadmaps. Since there is no single best research design approach

(Abutabenjeh & Jaradat, 2018), it is suggested that researchers should consider their circumstances, experience, and comfort levels. Nevertheless, their design approach should still meet the rigorous requirements of academically sound research.

1. **Honeycomb:** This methodology, developed by Wilson (2013), is conceptualized as representing a honeycomb, illustrated in Fig. 4 below.

Conceptually, the methodology illustrates its key elements surrounding the central research methodology aspect as follows:

- Research philosophy
 - Epistemology: Positivism, interpretivism, pragmatism, etc.
 - Ontology: Objectivism, subjectivism, axiology, biased, etc.
- Research approach: Inductive, deductive, etc.
- Research strategy: Qualitative, quantitative, or mixed-method.

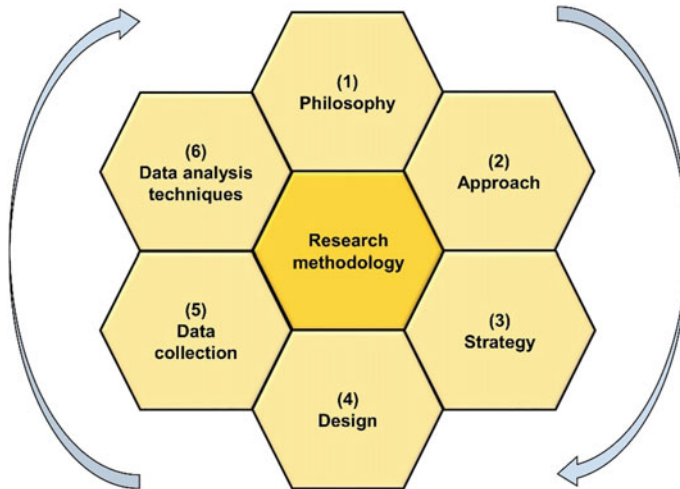


Fig. 4 Conceptual honeycomb methodology (*Source* Adapted from Wilson [2013])

- Research design: Action research, case study, experimental, longitudinal, cross-sectional, archival analysis, comparative, etc.
- Data collection: Interviews, questionnaires, observation, etc.
- Data analysis techniques: Descriptive or inferential statistics, grounded theory, narrative analysis, discourse analysis, value analysis, content analysis, etc.

Research onion: This methodology, developed by Saunders et al. (2019), developed a similar methodological concept to explain the research process, known as the research onion, which consists of six layers that could be peeled from the outside inwards, as illustrated in Fig. 5 below.

Conceptually, the methodology illustrates its key elements surrounding the central research methodology aspect as follows:

- Research philosophy: Positivistic, critical, interpretivist, pragmatic, etc.

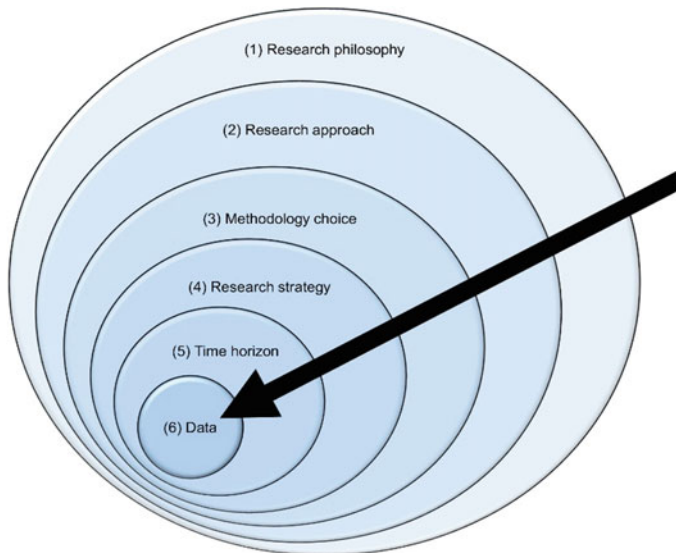


Fig. 5 Conceptual research onion methodology (*Source* Adapted from Saunders et al. [2019])

- Research approach: Deductive, abductive, or inductive.
- Methodological choice: Mono-method (quantitative or qualitative), mixed-method (quantitative and qualitative), or multi-method (more than just one quantitative and one qualitative).
- Research strategy: Experimental, survey, case study, action research, grounded theory, narrative inquiry, etc.
- Time horizon: Cross-sectional or longitudinal.
- Data: Collection and analysis techniques and procedures.

Sequential roadmap: Along similar lines is the seven-step research design framework proposed by Babbie (2004) and illustrated in Fig. 6 below:

Conceptually, the methodology illustrates a chronological sequence of events, working toward the culmination of the research, as follows:

- Purpose of the study: Defining the focus of the investigation.
- Conceptualization: Consideration of the key concepts and research terms.
- Research methods: Select the most appropriate approach to execute the research.

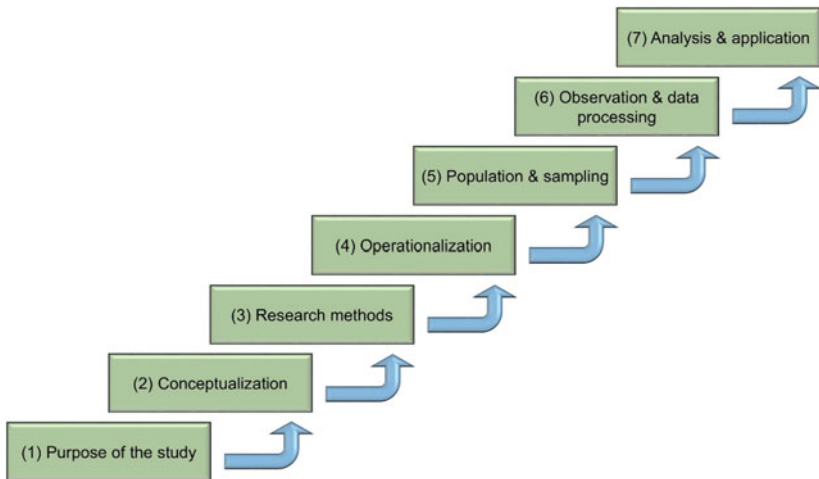


Fig. 6 Conceptual step methodology (*Source* Adapted from Babbie [2004])

- Operationalization: Defining of specific research approach to be followed.
- Population and sampling: Consideration of the *what* or *who* to research and population and sample characteristics.
- Observation and data processing: Collection of empirical data.
- Analysis and application: Interpretation of data necessary to respond to the research question.

As mentioned, there is not a singular best business research methodology. Nevertheless, it is also evident that these illustrated methodologies have more similarities than differences, and any differences are often semantic. As defined earlier, what is confirmed by the above examples is that *business research* is:

An academically sound and rigorous investigation into business issues to generate knowledge to support business decision-making.

Research Paradigm Fundamentals

As with design methodologies, there are also several research paradigms, all attempting to be reflective of valid worldviews and belief systems. However, we attempt to identify and elucidate relevant paradigms to guide the researcher for business research purposes. It should also be noted that although a particular paradigm represents its specific belief systems, there will be instances of overlap between various paradigms.

Jansen (2020b) mentions functionalism, behaviorism, modernism, structuralism, and neoliberalism as paradigm examples. In Table 1, authors such as Lincoln et al. (2011), Davies and Fisher (2018), and Saunders et al. (2019) state the aims and criticism of positivist, post-positivist, interpretive, critical, and pragmatic frameworks. As an extension of pragmatism, design science, as typically practiced by engineers and related practitioners, may also apply in business-related research (Vom Brocke et al., 2020).

From Table 1, it is clear that the aims and criticisms of each paradigm are unique. The following is a brief further explanation of the paradigms:

- **Positivism:** According to Rahi (2017), the proponents hereof “...believe that true knowledge can be obtained through observation and experimentation.” This paradigm uses collected evidence to test hypotheses, e.g., experimentation or statistically analyzed data.

Table 1 Research paradigm comparison

	<i>Aim</i>	<i>Criticisms</i>
Positivism	Generalize findings	It ignores individual experiences
Post-positivism	Uncover the meaning of reality	It doesn't produce well-defined answers
Interpretivism	Descriptive and explorative	Limited generalizability
Critical theory	Awareness and eliciting social change	It doesn't guarantee its aim of unrestraint
Pragmatism	Focus on <i>real-world</i> problems	Its flexibility may result in confusion
Design science	Create artifacts for innovative solutions to <i>real-world</i> problems	Does not fully recognize organizational context

Thus, positivism is the paradigm to adopt if the research emphasizes observable facts (Kankam, 2019).

- **Post-positivism:** This paradigm aims to bring theory and practice together. According to Henderson (2011), it moves “...*positivism from a narrow perspective into a more encompassing way to examine real-world problems.*” Nieuwenhuis (2020) concurs by stating that post-positivists search for evidence “*in terms of phenomena, rather than generalization.*”
- **Interpretivism:** Also considered *anti-positivism* or *constructivism* (Nieuwenhuis, 2020), this paradigm approach focuses on human actions and their understanding of processes in daily life activities (Kekeya, 2019). Jansen (2020b) concurs that since social conventions constitute human behavior, interpretation of such behavior is required.
- **Critical theory:** Like the above paradigms, the critical theory paradigm aims to understand reality better and generate new knowledge (Kekeya, 2019). Critical theory falls between interpretivism and positivism, with Jansen (2020b) arguing that it focuses on the essence of social experiences.
- **Pragmatism:** Kivunja and Kuyini (2017) believe that pragmatism originated in the claim that neither positivism nor interpretivism can uncover the *truth* of real-world issues. In context, pragmatism arguably has a similar essence as post-positivism (Henderson, 2011). However, whereas the latter is concerned with bringing theory and

practice together, pragmatism is guided by practical considerations, not theory.

- **Design science:** As an extension of pragmatism, this is a paradigm that seeks “*to extend the boundaries of human and organizational capabilities by creating new and innovative artifacts*” (Hevner et al., 2004), and it aims to provide solutions to real-world issues (Vom Brocke et al., 2020). However, a drawback is that design science does not fully recognize the role of organizational context in shaping the design and shaping the deployed artifact (Sein et al., 2011).

As alluded to earlier, practitioners in the industry are seldom concerned with high academic terminologies and associated philosophies. Nevertheless, to conduct academically sound research in searching for real solutions to business questions, Kankam (2019) believes that understanding relevant paradigms is essential in each research investigation.

Research Paradigm Assumptions

The ontological and epistemological assumptions are arguably the most relevant of each paradigm’s philosophical beliefs. Conceptually, ontology refers to the reality (or truth) that exists, and epistemology refers to the generation of knowledge and understanding. Nieuwenhuis (2020) believes that all good research is based on justifiable ontological and epistemological assumptions.

Table 2 provides an overview of the ontological and epistemological assumptions of the paradigms listed in Table 1 and the most appropriate research method within each paradigm context (Lincoln et al., 2011; Goldkuhl, 2011; Davies & Fisher, 2018; Saunders et al., 2019).

The table above highlights some differences and some similarities between the different paradigms. The pragmatism paradigm is somewhat unique in avoiding ontological and epistemological arguments (Brierley, 2017; Davies & Fisher, 2018), thus escaping the tensions between proponents of positivism and interpretivism.

Theoretical Framework

Except for the World 1 level, which focuses on daily life issues, the World 2 and 3 levels represent *scientific* and *meta-scientific* research (refer to Fig. 2), which means a theoretical foundation is necessary for business

Table 2 Summative paradigm assumptions and research method

	<i>Ontology</i>	<i>Epistemology</i>	<i>Research method</i>
Positivism	One actual reality; real-world driven	Objectivity and the scientific method	Quantitative
Post-positivism	Critical realism	Modified objectivity	Qualitative and quantitative—triangulation
Interpretivism	Complex with multiple meanings	Subjective and value-bound	Qualitative
Critical theory	Historical realism	Value-laden as knowledge is socially constructed	Qualitative
Pragmatism	Complex, rich with multiple realities	None—based on practical meaning	Qualitative, quantitative, or mixed-method
Design science	Any of the above	Diversity of types	Qualitative, quantitative, or mixed-method

research. Consequently, (scientific) business research requires a theoretical foundation to serve as a frame for interpreting the results.³

A theory may be defined as a methodical set of assertions that should hold under defined instances, and (1) should encompass certain factors, (2) relate to something, (3) have underlying dynamics, and (4) boundaries (Kessler, 2013). The business researcher needs to understand these four components well before using them as a contextual scope to interpret results.

Example : Research by Elsayed and Elbarden (2018) shows how the meaning of a study's results can be interpreted differently according to a selected theory. Their study discusses two opposing theories investigating the association between executive directors' remuneration and firm performance.

First, the agency theory posits that executives (as agents) seek high rewards while minimizing their efforts. Therefore, when a correlation study renders

³ Note that the theoretical foundation may not be of equal importance in all paradigms, e.g., the pragmatist and design sciences paradigms where a pragmatic problem solution or artifact is the primary objective.

a positive coefficient between the two variables, the researcher will interpret that better firm performance has led to higher executive remuneration.

Second, the tournament theory posits that paying executive directors higher rewards will encourage them to achieve higher performance levels in all facets of the firm. Therefore, the researcher will interpret the same correlation results that higher executive remuneration has led to better firm performance.

Rahi (2017) explains that a theory is a standardized basis to explain the relationship between the researched concepts and variables. Kivunja (2018) expands hereupon and believes the idea of a theoretical framework is defined as comprising the theories expressed by experts in the field of research, which may be drawn upon to provide the theoretical underpinnings of the data analysis and interpretation (Kankam, 2019) as follows:

- *Deductive reasoning* (often linked to quantitative studies) follows a process of deducing to test a theory (or hypothesis). It is typically associated with positivism and aims to generalize the research findings.
- In contrast, *inductive reasoning* (often linked to qualitative studies) is associated with developing a theory where the researcher induces their thoughts subjectively within an interpretive paradigm, and findings are not generalizable.
- *Abductive reasoning* is found when the researcher is not bound to specific ontological or epistemological assumptions, allowing the researcher to link the theory to the data between induction and deduction. (This approach overcomes some limitations experienced by deductive and inductive reasoning and is suitable when adopting a mixed approach, e.g., both positivism and interpretivism.)

Methodology

The research question is a way to summarize the problem statement. Jansen (2020a) believes that the methodology needs to reflect the specific type of research question and distinguishes between three kinds of questions, as follows:

- *Descriptive* questions focus on the typical how and what questions.

Table 3 Research methodologies associated with different paradigms

<i>Positivism</i>	<i>Interpretivism</i>	<i>Critical</i>	<i>Pragmatism</i>
Experimental	Naturalist	Neo-Marxist	Naturalist
Quasi-experimental	Narrative inquiry	Feminist theories	Narrative inquiry
Correlational	Case study	Cultural studies	Case study
Causal comparative	Grounded theory	Critical race theory	Phenomenology
Randomized control	Phenomenology	Freirean studies	Ethnography
Survey research	Hermeneutics	Participatory	Action Research
	Ethnography	emancipation	Experimental
	Phenomenography	Postcolonial	Quasi-experimental
	Action research	Queer theory	Causal comparative
	Heuristic inquiry	Disability theories	
		Action research	

Source Adapted from Kivunja and Kuyini [2017]

- *Explanatory* questions aim to seek a deeper understanding of a research problem.
- *Exploratory* questions are used when a researcher is unsure about the nature and extent of a complex research problem.

As per Fig. 1, the methodology aspect bridges the divide between the philosophical, paradigm, and theoretical elements and the applied research methods. According to Kivunja and Kuyini (2017), various methodological approaches can be associated with positivism, interpretivism, and critical and pragmatic paradigms (Table 3 below). Note that post-positivism is not listed. This is because it combines positivism and interpretivism. Therefore, the methodologies listed under both those two paradigms apply to post-positivism. Furthermore, design science is also omitted in Table 3. The reason is that design science “*has found an appropriate paradigm in pragmatism*”; however, other paradigmatic influences cannot be ignored (Goldkuhl, 2011). Therefore, for the purposes of this book, the methodologies listed under pragmatism are mainly applicable to design science; however, methodologies listed under, for example, positivism and interpretivism may also be applicable.

Method

The study method includes how evidence is gathered to solve the research problem. In other words, this is the data collection process. The data collection needs to be clarified in the study’s design stage. All three

scholars give examples of data collection: Wilson (2013), Steps 4–5 (Fig. 4); Saunders et al. (2019), Steps 4–6 (Fig. 5); Babbie (2004), and Steps 5–6 (Fig. 6).

As indicated by the above scholars, there are only two data types, quantitative and qualitative. Therefore, data is collected (and analyzed) according to a specific method, quantitative or qualitative. This relates to the level of theoretical reasoning (as discussed above), deductive and inductive, respectively. The reason refers to a specific paradigm, positivists, and interpretivism.

Tubey et al. (2015) provide a thorough description contextualizing qualitative and quantitative methodologies in Table 4.

The method concludes the design component of ProDEC. The following two sections discuss the evidence and conclusion sections.

4.4 *Research Evidence (ProDEC)*

This section represents the physical collection and analysis of the data. The planning/design of how data will quantitatively or qualitatively be collected and analyzed is explained in Sect. 4.3 above. The method focuses mainly on the collection of data. Examples hereof are given by: Wilson (2013), Steps 4–5 (Fig. 4); Saunders et al. (2019), Steps 4–6 (Fig. 5); Babbie (2004), and Steps 5–7 (Fig. 6). Note that these figures include some data-related aspects, such as the data collection, type of data, and time horizons of the collection period.

To obtain evidence, the collected data needs to be analyzed. Note that this data analysis is part of *finding evidence*. However, the appropriate techniques need to be selected during the study design. The analysis is the last step in the three design examples, namely: Wilson (2013), Step 6 (Fig. 4); Saunders et al. (2019), Step 7 (Fig. 5); Babbie (2004), and Steps 7 (Fig. 6).

Typically, quantitative business research can help analyze an association between variables statistically. For example, determine whether a variable such as gender, age, education, training, etc. is significant (or not) to another variable such as productivity, financial performance, staff remuneration, employee loyalty. This is typically a positivistic study that deductively *tests* a theory, such as a gender theory that recognizes differences in gender behavior or performance. On the other hand, data can be collected from various sources, qualitatively analyzed, and interpreted to,

Table 4 Difference between quantitative and qualitative research methods

<i>Quantitative</i>	<i>Qualitative</i>
Objective in nature	Subjective in nature
Deductive: Tests theory	Inductive: Develops theory
Research questions: How many? Strength of an association?	Research questions: What? Why?
“Hard” science	“Soft” science
A literature review must be done early in the study	The literature review may be done as the investigation progresses or afterward
One reality: The focus is concise and narrow	Multiple realities: The focus is complex and broad
Facts are value-free and unbiased	Facts are value-laden and biased
Reduction, control, precision	Discovery, description, understanding, shared interpretation
Measurable	Interpretive
Mechanistic: The parts equal the whole	Organic: The whole is greater than the parts
Uses subjects/objects/items/specimen	Uses participants
Context-free	Context-dependent
Has hypothesis that is usually tested	Research questions
The reasoning is logistic and deductive	The reasoning is dialectic and inductive
Establishes relationships, causation	Describes meaning, discovery
Strives for generalization leading to prediction, explanation, and understanding	Strives for uniqueness. Patterns and theories are developed for understanding
Highly controlled setting: experimental setting: Outcome-oriented	Flexible approach: natural setting: Process-oriented
Uses instruments	Uses communications and observation
The sample size is an issue of concern	The sample size is not a concern; it seeks an “informal rich” sample

Source Adapted from Tubey et al. [2015]

for example, *develop* a strategy to improve productivity, employee loyalty, financial performance, etc.

It is clear from the above authors that different data analysis techniques are available. Descriptive or inferential statistics objectively analyze quantitative data. Qualitative data is more subjectively interpreted by content, value, discourse, narrative analysis, and grounded theory.

4.5 *Research Conclusion (ProDEC)*

Even though the conclusion is the final step in the *ProDEC* framework, it is often quite an involved and time-consuming phase that business researchers frequently underestimate. In essence, the conclusion should:

- Summarize the research findings and interpret them in the selected paradigm, philosophy, and theory context.
- The conclusion must be directly aligned with the research problem, question, and objectives.
- The practical value and implications of the research need to be explained, which is especially significant for business researchers.
- Potential limitations also have to be acknowledged, and the recommendations and research implications should be viewed with such limitations in mind.
- Potential gaps and shortcomings identified during the research may be highlighted, which may serve as recommendations for further research.

5 SUMMARY AND MAP

5.1 *Roadmap*

Table 5 summarizes the content from the above discussions of the research process. The four main elements in the research process are shown in the first column, problem, design, evidence, and conclusion, representing the ProDEC framework. The central part of this table is the research design, which is based on Hesse-Biber and Leavy's (2011) view of how research methodology bridges the philosophy side (paradigms, assumptions, and theory) and the method (data collection).

For consistency, the outline of the illustrative business research examples in the essays is according to the roadmap in Table 5.

5.2 *Layout of Essays*

Even though each of the illustrative essays is representative of independent work, each follows a similar basic framework (or layout). This illustrates the systematic process of each essay and eases the relative comparison between the various essays. The general form is as follows:

Table 5 ProDEC-based roadmap to a conceptual framework

Problem	Research question and hypothesis		
Design	Methodology	Research paradigms	Positivistic; Post-positivistic; Interpretive; Critical; Pragmatic (including ADR), etc.
		Paradigm assumptions	Ontology; Epistemology; Axiology; Methodology
		Theory	
	Philosophy	Theoretical framework	
		Theoretical reasoning	Deductive; Inductive; Abductive
		Purpose	Descriptive; Exploratory; Explanatory
	Method	Data collection	Ethnographic; case study; action/participation research; surveys; comparative; experimental; evaluation; analytical; archival; grounded theory; phenomenology; narrative inquiry; etc.
		Data handling	Qualitative; Quantitative
		Collection choice	Mono-method; mixed-method; multi-method
		Data source	Primary: interviews, observations, questionnaires, etc.; Secondary: documents, census, etc.
		Data type/ time horizon	Longitudinal, cross-sectional, panel
	Methodology		
Evidence	Results (findings) through data analysis (Statistics; Content analysis; Discourse analysis; etc.)		
Conclusion	Interpretation of results through the lens of a paradigm and a specialized lens of a theory or theoretical framework		

Title

Author(s) Including Affiliation, Address, Email, ORCID

Abstract Clearly indicate the background of the study, problem/objective(s), research design, evidence, conclusion, and research experience/practical value.

Keywords 4 to 6 keywords/terms in alphabetical order.

JEL Classification 3 most relevant codes, e.g., M41 (Accounting).

The chapters that contain the illustration of the practical application are structured along six sections as follows:

- Introduction
- Background of the study (brief explanation of background/ problem and objectives)
- Explaining and describing the research design (Methodology, i.e., philosophical approach and method)
- Evidence found in the study (summary of data analysis)
- Conclusion (including theoretical contribution and practical value)
- Highlight the practical experience of issues incurred during the study and recommend managing these issues in future studies.

6 CLOSING

This chapter addressed the first goal as set out in the introductory chapter, namely, to unpack and simplify some of the critical research aspects to be cognizant of when embarking on business research, geared especially toward business managers desirous of addressing an experienced business issue or problem, in a rigorous scientific manner.

The chapter started by explaining the concept of research, covering areas such as the definition of research and emphasizing its systematic process. At the research level, various business problem types and anticipated resolutions are contextualized based on a *three-world framework*. The bulk of the chapter provided a conceptual framework based on the so-called *ProDEC* acronym that forms the foundation of the research execution. Within the abbreviation, the concepts of the research problem, the research design, the research evidence, and the research conclusion are embedded.

Finally, the chapter provides a potential framework that aspirant business researchers can use in planning their research and concludes with a generalized layout of the various illustrated essays.

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The Effect of the Adoption of International Financial Reporting Standards on Foreign Portfolio Investment in Africa

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1 INTRODUCTION

This chapter aims to demonstrate the research process to determine the effect of adopting International Financial Reporting Standards (IFRS) on foreign portfolio investment (FPI) in Africa. The demonstration contains four main sections: the research problem, design, evidence, and conclusion. The paper is finally resolved with some concluding remarks on the research process.

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The “research onion” developed by Saunders et al. (2012) is a well-known approach that many previous researchers used in their studies’ design, for example, Mafuwane (2012), Ihuah and Eaton (2013), and Gerber (2015). The research onion was selected to present systematically step-by-step the methodological research process followed in the study’s design.

The research onion concept comprises seven layers, beginning with the philosophical assumptions of a study. This includes the (i) epistemological assumptions (e.g., interpretivism, positivism, pragmatism, realism, etcetera) and (ii) ontological assumptions that define the reasoning of the research method, namely induction, deduction, abduction, or any combination of them. This is followed by (iii) contextualizing the study within a selected theory, (iv) the methodological choice among qualitative and quantitative or a combination of them (mixed method), (v) the strategy to collect data from primary or secondary sources, (vi) the characteristic of the data which includes time-series or cross-sectional data or a combination of them (longitudinal or panel data), and (vii) finally, the procedures and techniques to collect and analyze the data.

The above concept was selected to investigate the effect of IFRS adoption in Africa on FPI. The importance of this topic elucidates that only one-third of the African countries adopted IFRS compared to an almost two-thirds adoption rate of countries globally (Boolakay et al., 2020). This study set out to test the hypothesis that IFRS adoption in African countries would lead to increased levels of their FPI, which will favor their economic growth.

To reach the purpose of the study, a positivistic paradigm was selected as secondary quantitative data were collected and deductively analyzed. Since IFRS was developed to meet the need for portfolio investment (capital market participants), the research design was within the context of the decision-usefulness theory (AAA 1966; Chambers, 1955).

A quantitative ex post facto strategy was followed that implies that researchers cannot control the variables because it is impossible for them to manipulate the exploratory data (Manyara, 2013). Mathematical models were formulated, and statistical analysis was applied to reveal the research findings. In conjunction with the literature review, results from regression analysis paved the way to conclude the study.

2 RESEARCH PROBLEM

The research methodology process employed in this paper is closely connected to the research questions. This section provides background information and the literature that built up the research questions, which summarizes the research problem.

After the Second World War, the drive became more pronounced to move toward a uniform international accounting standard of high-quality (Ortega, 2017). This idea came to reality when the International Accounting Standards Board (IASB) was established to develop a single set of accounting standards. Worldwide many countries, including various African countries, have adopted IFRS (Ball, 2016; Gordon et al., 2012).

Accounting researchers hypothesized that the development of IFRS would improve the usefulness of companies' financial reporting, as this will facilitate and enhance the quality of the reliability, credibility, transparency, and comparability of financial statements internationally (Kimeli, 2017; Kribat, 2009; Mardini et al., 2012).

In the extant literature, Amiram (2012), Hamberg et al. (2013), Hong et al. (2014), Chen et al. (2014), Beneish et al. (2015), Ng (2015) and Ball (2016) claim that IFRS's enhanced reporting quality will benefit the adopting countries' foreign capital inflows. However, contrary to the above studies that found a positive association between foreign investment inflows and IFRS adoption, a few studies could not support this hypothesis, such as Sherman and De Klerk (2015), Nnadi and Soobaroyen (2015), and Efobi (2017).

Based on the above, the mixed results imply there is no consensus in the literature that IFRS adoption by countries led to an increase in foreign capital inflows. This is confirmed by Ball (2016), who stated a decade after the development of IFRS that there is not enough evidence that IFRS achieved its aim, namely to promote foreign investment inflow (especially FPI) in the adopting countries.

Therefore, this implies that the actual effect of IFRS adoption on FPI remains uncertain and unknown. A further motivation for this study is that many previous studies-investigated countries with advanced economies. It cannot be assumed that those results are also relevant to African countries. This essay aims to fill that gap in the literature, to test the pre- and post-effect of IFRS adoption on FPI in Africa. In other words, investigate the extent of the effect of IFRS adoption on FPI

inflows in African countries. That leads to the objective to empirically test the association between IFRS adoption and FPI in Africa.

To reach this objective, three research questions must be answered. The first and main research question is:

- (i) Is there a statistically significant difference in FPI inflows in IFRS-adopted African countries between the pre- and post-adopting periods?

The two secondary research questions are:

- (ii) Is there a statistically significant difference in the extent and magnitude of FPI levels between IFRS-adopted and non-adopting countries?
- (iii) What factors have a statistically significant effect on IFRS adoption in Africa?

3 RESEARCH DESIGN

3.1 *Introduction*

To demonstrate the research design and the methodology to answer the research questions, the research onion of Saunders et al. (2012) was adopted. The research onion enables the researchers to ‘peel’ each of the seven layers of the onion from the outside to the inside.

Figure 1 below exhibits the research onion, which indicates the chronologic order of the design, from the start, the philosophic choice to the end, and the final data analysis. As a result of space restriction, this section only discusses the concept(s) or item(s) selected for the study. For example, the first layer, which represents the philosophy paradigms (3.2), initially investigated four paradigms, i.e., positivism, interpretivism, pragmatism, and realism. Only positivism, the paradigm chosen for the study, will be discussed and demonstrate how it was applied in this study.

The second layer represents the research approach (3.3). Deductive reasoning was appropriate for this study among inductive and abductive reasoning. Various theories were considered in the third layer to conceptualize the study (3.4); however, the researchers selected the decision-usefulness theory, which was found the most appropriate. The methodological choice between qualitative and quantitative research led

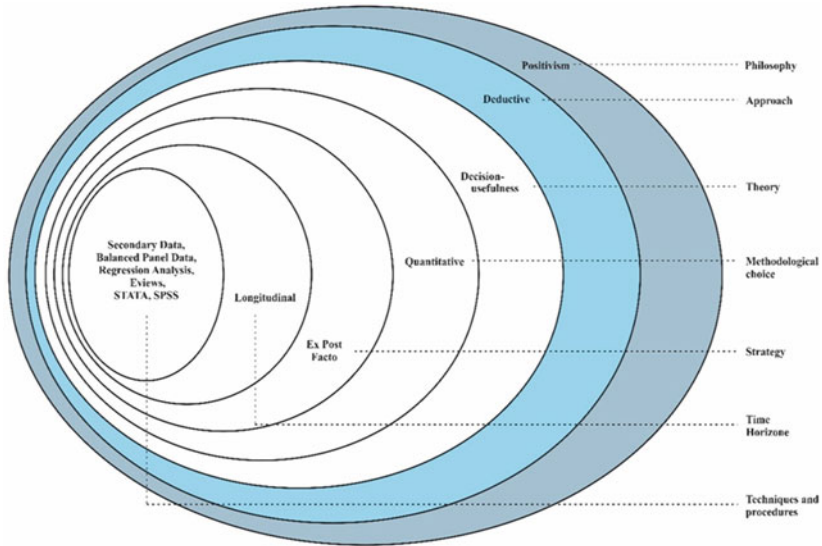


Fig. 1 Explicit philosophical perception and approaches adopted for this study (*Source* Adapted from Saunders et al. [2012])

to the latter being adopted in the fourth layer (3.5). An ex post facto strategy was adopted in the fifth layer (3.6) since the nature of the collected data is secondary and publicly available, which cannot be manipulated by the researchers. The sixth layer exhibits that longitudinal data was used to define the time horizon of the study (3.7) because a combination of time-series and cross-sectional data was used. The seventh layer (3.8) indicates that the study used various regression analysis models to answer the research questions.

3.2 *Research Paradigmatic: Positivism*

Defining a Research Paradigm

Research methodology embraces the researcher's philosophical position, which dictates the kind of research that the researcher has in mind (Collis & Hussey, 2014). Neuman (2014) posits that this philosophical foundation indicates how the researcher sees and experiences the world, and the assumptions thereof constitute the core of the research under investigation.

Therefore, one or more assumptions will determine any study's approach and the most appropriate paradigm. Ihuah and Eaton (2013) clarify that the research philosophy is an aid to the researcher since understanding the philosophy will help to simplify the study's design and to select the most appropriate method and procedures. Consequently, a clear understanding of the philosophical context and perspectives or research paradigm is the first issue that should be addressed when commencing a new study.

A research paradigm is defined as a fundamental way of thinking and the scientific actions in conducting a study (Coolican, 2014). Another perspective on the definition is provided by Kivunja and Kuyini (2017). They elucidate that a research paradigm specifies how a researcher perceives the world of science; that includes the thinking, shared beliefs, and perceptions that will support the researcher to understand better the nature of the required data and how the analysis thereof should be interpreted. Therefore, relevant to this study, a research paradigm embraces the methodological process of investigating to understand better a particular social event (IFRS adoption in African countries) and to explain that event.

Positivism

Positivism as a paradigm was found to be appropriate for this study; as confirmed by Collis and Hussey (2014), this paradigm originated from the natural sciences and gave a basis to conduct the study scientifically. Furthermore, Bisman (2010) stated that since positivism stems from the philosophy of realism, it is popular and extensively used in researching social sciences.

Kivunja and Kuyini (2017) describe positivism as a paradigm that provides a worldview to the scientific method of research through experiences, observation, and experimentation to establish a basis for (i) understanding social behavior and (ii) explaining reality scientifically. Collis and Hussey (2014) add that positivism is constituted by the assumption that reality is objective, i.e., independent from the researcher, and singular, implying that a research question has only a single answer. This study's association between two variables, FPI and IFRS adoption, has been questioned. This seeking of an association was cooperative to formulate a hypothesis to test the effect of IFRS as a reality in influencing FPI. This hypothesis might render only a single answer, either accept (support) or reject the hypothesis.

Positivism assumes that anything that can be perceived through the human senses is absolute (Sarantakos, 2013). This implies that reality exists external to human perception and rational thinking. Therefore, Cooper et al. (2014) explain that a researcher who adopts a positivistic paradigm as research philosophy acts as objective as possible to minimize or eliminate research bias. Consequently, the researcher is objective, value-free, and independent when viewing the world. Relevant to this study is that secondary publicly available data of a twenty-two-year period for many countries were collected. The researchers could only act objectively, value-free, and independently in the collection and analysis process as they could not change any of the FPI, IFRS, and covariates data.

Institutions such as the International Accounting Standards Board (IASB) and the Financial Accounting Standards Board (FASB) were established as international accounting standard setters. They aim to develop a single accounting standard set. Their existence results from a worldwide joint effort that includes the cooperation of various nations representing various regions. Elkhashen and Ntim (2018) mention that the accounting standard setters formulated an absolute reality. Those accounting standards may faithfully influence companies' financial statements' representation as economic reality. This reality became facts and became part of society through legislation, morals, role, and economic activity (Mattessich, 2003).

IFRS became a reality by formulating a standard for preparing and reporting company financial statements worldwide. Those IFRS-bounded financial statements represent an economic reality of which its true value depends on the extent to which it enables the end-users of the statements to engage with the world (Elkhashen & Ntim, 2018). From the above arguments, it can be deduced that the fundamental truth of accounting, as presented in company financial statements, is an economic reality. However, Collis and Hussey (2014) argue that reality comprises many activities and can be researched by various philosophical paradigms. In this study, the researchers adopted the positivistic research paradigm and its assumption as the worldview.

An assumption of the positivistic ontology relevant to this study is that IFRS is a reality that exists independent and external to the accounting language and research. As accounting is closely tied to an objective reality (Mckernan, 2001), the essence is that accounting is a language of communicating reality objectively. To summarize, it appears that company financial statements are a reality to prepare and report the economic

reality truthfully. Only the truth is an aid to the decision-usefulness of financial statements as a source to make economic decisions.

This concluded 3.2, the discussion of the research paradigm with particular reference to positivism as the underlying philosophy for the study. The following section discusses the applicable reasoning for this study. With a selection among abductive, inductive, and deductive reasoning, the most applicable found was deduction. This reasoning approach is significant in providing a base to test the selected decision-usefulness theory through empirical data analysis.

3.3 *Research Approach: Deductive Reasoning*

This study is conducted in the broader field of accounting, which aims to support the users of accounting information to make sound portfolio investments. Therefore, the link between IFRS as an aid to enhance the usefulness of company financial statements is significant in this study. A positivistic research paradigm applies to this research as it aims to test some hypotheses using statistical analysis. To interpret the outcomes of the hypothesis testing, deductive reasoning was found appropriate to interpret the results within the context of the decision-usefulness theory.

Deductive reasoning stems from the exact sciences where nature laws, which are independent of human cognition, provide a basis (i) to allow expectations (such as hypotheses), (ii) to explain phenomena, and (iii) to predict occurrences for interventions (Collis & Hussey, 2014). This can be summarized that deductive logic is all about examining or testing a hypothesis within the context of a selected theory. Riahi-Belkaoui's (2012) opinion that accounting theory, which aims to communicate useful information to users via financial statements, provides a suitable basis to explain accounting behavior and phenomenon. Therefore, relevant to this study is that the first step in applying deductive reasoning was to develop some hypotheses. This is followed by a structural approach to empirical testing of the hypotheses through statistical analysis (Riahi-Belkaoui, 2012).

The study's first and main research question, to determine whether there is a difference in countries' FPI levels pre- and post-IFRS-adopting periods, was rephrased to convert it into a hypothesis, i.e., there is a statistically significant relationship between FPI and IFRS adoption. The literature review also shows that, except for IFRS adoption, numerous factors might also influence FPI inflows, for example, a country's effort

to control corruption, how open the economy is, and how much the company tax rate is, etcetera. By gathering all the variables, a mathematical model could be formulated to form a basis to analyze the collected data statistically.

Deductive reasoning was also applied to answer the second research question. First, the question was converted into a hypothesis to statistically test for a significant difference in FPI levels between IFRS-adopted and non-adopting African countries. Data were collected to accommodate all African countries, i.e., those who adopted IFRS, and therefore, enforcing listed companies to apply it, and those countries where IFRS is not permitted. Again, a mathematical model was formulated to include FPI, IFRS, and various other factors that might influence FPI inflows. This model was the basis for statistically analyzing the data.

The third research question focused on the factors associated with why countries chose to adopt or not to adopt IFRS. A hypothesis was developed to test statistically for a significant relationship between countries' IFRS status and various factors. From the literature, it was clear that factors such as culture and education level of residents could influence the decision whether to adopt IFRS. A mathematical model was developed that excluded FPI as a variable. Only countries' IFRS status and the potential factors that might influence the IFRS adoption choice were included. This model was also the basis for statistically analyzing the data.

In conclusion, the acceptance or rejection of the hypotheses would form the basis for predicting the future usefulness of accounting standards. The following section deals with the decision-usefulness theory as a foundation to contextualize the study.

3.4 *Theory: Decision-Usefulness Theory*

Researchers such as Beneish et al. (2015) emphasize that adopting IFRS brings informational changes due to its inherent propensity to eliminate the informational challenges of listed companies' published financial statements. Since potential and existing investors from foreign regions are confronted with these information challenges, it was sensible to consider the decision-usefulness theory as established by AAA (1966) and Chambers (1955) to contextualize this study.

The literature review revealed that, except for IFRS adoption, many other factors might influence foreign investment, specifically FPI. Furthermore, the literature also shows that there are many factors to consider that

potentially influence countries' authorities on whether to adopt IFRS. With all those variables to keep in mind and considering which should be included in the analysis, a single theory might not be sufficient to accommodate them. Therefore, except for the decision-usefulness theory, several theories were considered and investigated to some extent relevant to this study. They are the agency theory, institutional theory, information asymmetry theory, stakeholder theory, and the appropriate theoretical underpinning. None of those was selected as the leading theory for the study. However, knowledge about them helped interpret some of the results where the decision-usefulness theory was not prominent.

The drive to select the decision-usefulness theory to conceptualize the study was supported by Van Greuning et al. (2011). They reasoned that the primary aim of companies' financial statements is to provide relevant, reliable, comparable, and understandable accounting information for various users. Furthermore, the literature emphasizes the importance of decision-making for investors, especially when they are confronted with unknown conditions such as company (unsystematic) risk and market (systematic) risk (Smith, 2003). In addition, Kribat (2009) emphasizes that it is significant for investors to adopt a behavioral framework to guide decision-making under uncertainty. In this regard, researchers addressed this gap in the literature to develop theories in the finance and broader economic sciences with more emphasis on financial accounting, which aim to enhance the decision-usefulness of accounting reporting. Those theories provided a sound basis for the IASB to develop a conceptual framework for accounting (Smith, 2003).

The decision-usefulness theory provides a proper foundation when researchers question or evaluate the relevance of the accounting standard framework (IFRS) to preparing company financial statements. Therefore, the theoretical evaluation to address the research problem, i.e., that the association between IFRS adoption and FPI in Africa is not clear, was conceptualized in the decision-usefulness theory. This is supported by the principle that IFRS adoption will lead to more reliable, accurate, and comparable company financial statements.

AAA (1966) remarks that the relevance of accounting standards, i.e., IFRS in the context of this study, is all-encompassing. That implies that users of accounting can make informed economic and investment choices. In this context, the decision-usefulness theory hypothesizes that IFRS adoption in countries is positively associated with the FPI inflows.

Consequently, a priori assumption in this study is that there is a positive relationship between IFRS adoption and the level of FPI inflows. Various previous studies support this assumption, for example, Amiram (2012), Ben-Othman and Kossentini (2015), Beneish et al. (2015), and Efobi (2017). They also believe that IFRS adoption will invigorate capital market participants' activities in the adopting countries. This is because the participants (investors) want reliable, coherent, and more transparent accounting information to make investment decisions, especially FPI decisions.

This section concludes that IFRS adoption leads to enhanced usefulness of company financial statements that may provide improved support to investors in making sound investment decisions. Furthermore, the theory of decision-usefulness is influenced by the relevance of accounting information. Consequently, this theory is selected to serve as a lens to interpret empirical evidence that determines the explanatory power of accounting information to promote FPI inflow.

3.5 *Methodological Choice: Quantitative Research*

Quantitative research is a method characterized where statistical tools are applied to analyze variables to test theories (or hypotheses) that comprise variables (Creswell, 2014). Furthermore, it is helpful to the researcher to deeply understand the research question as it enables the researcher to develop a hypothesis to be tested. Mathematical models assist the testing process in determining whether the outcome of the analyzed data supports or contradicts the expected generalizable outcome. A quantitative method assists in testing the hypothesis using a positivistic research paradigm, which is vital as it enables the researcher to complete the process objectively (Janowicz, 2005). The data that quantitative research requires are in the form of numbers. Other non-numerical data can only be used after numerical quantified (Golafshani, 2003). Golafshani (2003) further remarks that mathematical models are applied in processing the data, and the results are presented statistically.

The methodological choice of quantitative research applied to this study since (i) hypotheses were developed to be tested, (ii) only numbers and quantified numerical data were collected, (iii) mathematical models were formulated to process the data, (iv) the results were presented statistically, and (v) the researchers were neutral and conducted the study objectively.

3.6 *Strategy: Ex Post Facto*

SAUNDERS et al. (2012) identify eight research strategies: ethnography, archival research, grounded theory, narrative inquiry, case studies, action research, surveys, and experiments. Creswell (2014) indicates that the first six strategies are applied in qualitative research. Only the last two surveys and experiments are relevant to quantitative analysis.

However, a survey strategy was found not relevant for this study. Surveys include data collection strategies such as questionnaires, interviews, and structured observations. None were applicable since this study obtained secondary data from various sources.

An experimental research strategy was also found not relevant for this study. Experimental research stems from scientific research and is strongly related to the natural sciences. Experimental research is also known as “after the fact.” It often generates hypotheses where an association between a dependent and an independent variable is tested. This strategy allows the researcher to intervene with the data and modify it to suit the purpose (Cooper et al., 2014).

Quantitative ex post facto research was a suitable strategy for this study. This is opposed to experimental research since it does not allow the researcher to intervene with the data (Manyara, 2013). That means the researcher does not have control over the variables. Therefore, this is an alternative resource to experimental research to determine the relationship to estimate the extent to which the dependent variable is influenced by the independent variable (Simon & Goes, 2013). These authors further explain that this strategy is applicable when this is impossible for the researcher to alter the data. That implies that data used in the study existed before the research commenced. This confirms that the researcher stays objective and independent since data cannot be manipulated.

This study developed hypotheses, and the core (central hypothesis) was to examine the relationship between IFRS adoption and FPI in Africa. The analysis of the data aimed to estimate the extent to which FPI inflows (dependent variable) are affected when there is a change in a country’s IFRS status (independent variable). Secondary IFRS-status data, FPI data, and covariate data (other intervention factors) were collected and existed already before this investigation began. This makes the ex post facto research strategy suitable for the study since the data had already existed before the investigation commenced, and the researcher could not control or manipulate it.

3.7 *Time Horizon: Longitudinal Design*

The two-time research horizons identified in Saunders et al.'s (2012) research onion are cross-sectional and time-series designs. A combination of those two designs is known as panel data, also called a longitudinal design, and applies the observation method that requires the researcher not allowed to intervene with the variables included in the data (Brink et al., 2006).

On the one side is time-series data collected over a period, e.g., weekly, monthly, annual data, etcetera. Thus, data are investigated over time. Cross-sectional data are related to different cases, e.g., countries, individuals, companies, etcetera. The cases are researched at a specific time to determine their relationships, patterns, or differences (Bryman & Bell, 2015).

Based on the above description, a longitudinal design was found applicable for the study. Firstly, time-series data were collected annually for a 22-year period that covers 11 years pre- and 11 years post-IFRS adoption. Secondly, data were collected for 35 African countries to determine the effect of IFRS adoption on their FPI performance. Therefore, time-series and cross-sectional data were collected for the variables, IFRS status, FPI, and other covariates or factors.

3.8 *Techniques and Procedures*

The Population

Africa includes 54 independent countries, forming the study's target population (United Nations Conference on Trade and Development, 2016). For this study, the 54 countries are divided into four groups, (i) IFRS adopted—required for all listed companies to comply with IFRS, (ii) IFRS needed in some listed companies, (iii) IFRS permitted—listed companies can make their own decision whether to use the country's National Accounting Standards or IFRS, and (iv) where IFRS not permitted. Of the 54 countries, 19 have incomplete data and were omitted from the study. Therefore, only 35 countries were analyzed over 22 years.

Data Collection Method

Secondary data were collected from various globally recognized sources. The International Monetary Fund's publication on financial statistics

provided the FPI inflow. FPI data are available in the “balance of payment and international investment position.” Covariate data and factors that might influence the choice of adopting IFRS were sourced from the World Bank’s Development Indicators, Transparency International, and the World Governance Indicator. Many related studies (in accounting, finance, and economics) also used data from the above international political and economic institutions (Ben-Othman & Kossentini, 2015; Efobi, 2017; Gordon et al., 2012; Ng, 2015). IFRS data were sourced from global auditors’ firms like the Deloitte and PwC websites.

Data were gathered from those institutions: 15 countries with complete data that adopted IFRS, including the 11 years pre(1994 to 2005)—and the 11 years post(2006 to 2015)-adoption. Twenty countries with complete data which did not adopt IFRS, for the 11 years from 2005 to 2015, on various estimates such as the covariate and other factors mentioned above, IFRS and FPI data. These collected data were included in the mathematical models for statistical analysis.

Model Specifications

Longitudinal designs were adopted by most researchers in the fields of economics, finance, and accounting to empirically test the association between IFRS adoption and foreign direct and portfolio investments (e.g., Amiram, 2012; Beneish et al., 2015; Ben-Othman & Kossentini, 2015; Efobi, 2017; Gordon et al., 2012; Ng, 2015).

This study applied two different multiple regression analyses for statistical estimation because the three research questions differ in nature. Two multiple panel data regression models were formulated to answer the first and the second research questions. The two models were analyzed by four regression types suitable to accommodate panel data. This approach allows only the models’ results that show the most significant relationships are used to conclude the study. The following models were used to estimate the relationship between IFRS adoption and FPI, (i) the pooled ordinary least square (POLS), random-effects model (REM), fixed-effects model (FEM), and the system-generalized method of moment model (SGMM). SGMM is a technique to address the endogeneity problem, usually found with the panel data regression analysis. FPI was the dependent variable in both regression analyses, IFRS adoption the primary (or exploratory) independent variable, and various covariates the other independent variables.

The covariates included in this study are capital market size, control of corruption, corporate tax rate, economic growth rate, exchange rate, inflation rate, interest rate, regulatory quality index, and trade openness. These factors were selected as the literature review indicated them as benchmark factors that may affect foreign investment (Ben-Othman & Kossentini, 2015; Gordon et al., 2012; Ng, 2015).

A logit regression model was applied to answer the third research question. This is to determine which factors have a significant effect on the decision of whether to adopt IFRS. IFRS status was the dependent variable in this model, and various potential factors influencing IFRS adoption were the independent variables. The independent variables selected from the literature are culture, corporate tax rate, economic growth, external pressure, investor protection, legal system, level of education, market capitalization, political system, and trade openness (Gordon et al., 2012; Jaggi & Low, 2000; Kolsi & Zehri, 2013; Pricope, 2016).

Methods of Estimation

Four basic estimation techniques typically used in panel data analysis were applied to report the analyzed data. Firstly, descriptive statistics expressively summarize data to describe observations. This included minimum and maximum values, the mean with its standard deviation, and the coefficient of variation. Additionally, in this study, the Wilcoxon signed-rank test (WSRT) was used to compare whether there is a statistically significant difference in FPI inflow levels between the pre- and post-IFRS-adoption periods of the 15 adopted countries. WSRT is like the t test. However, it is a non-parametric method using ranking values instead of continuous values to compare two groups in a single sample.

The second estimation analysis was Pearson's correlation matrix. Numerical continuous values were used to determine whether a linear relationship exists between all the variables included in a regression model (Jaccard & Becker, 2010). The variance inflation factor (VIF) test was performed to support the Pearson correlation matrix. This is a collinearity diagnostics test to detect multicollinearity, which assists the researcher that co-variables in a specific regression model are not too highly correlated.

Thirdly, a unit root test was conducted. Choudhary and Bajaj (2013) emphasize this need since panel data analysis has the common problem of the non-stationarity of the data. The Im Pesaran and Shin (IPS) and

Dickey-Fuller (ADF) tests were performed to test the properties of the panel data for the presence of stationarity and to address the problem.

Although all the above preliminary estimation techniques are frequently used in panel data analysis, the problem is that none of them can explain the cause-and-effect relationship which may exist between FPI and IFRS adoption. Consequently, an inference may not be reached. Therefore, multiple regression analysis is the fourth technique applied.

To answer the first research question, two models were run for the 15 IFRS-adopted countries pre(1995–2004)—and post(2005–2015)-IFRS adoption. For the second research question, all 35 countries were included from 2005 to 2015. For the first and second research questions, the panel data regression model uses the POLS, REM, FEM, and SGMM.

For the second research model, a logistic regression model was employed to determine the factors that might influence whether or not IFRS is adopted in African countries. Logistic regression was applied since the dependent variable is categorical, e.g., ‘1’ if IFRS is adopted and ‘0’ if not. This is to answer the third research question.

4 RESEARCH EVIDENCE

In answering the first and main research question, the study found a statistically significant positive relationship between IFRS adoption and FPI inflows. In other words, the countries that adopted IFRS have experienced a significantly higher FPI inflow after adoption.

For the second research question, the study found a statistically positive significant difference between the FPI inflows of IFRS-adopted and non-adopted African countries. In other words, the IFRS-adopted countries outperformed the non-adopted countries with FPI inflows.

Finally, for the third research question, the results of the logit regression analysis showed that culture, investor protection, legal system, market capitalization, political system, and taxation were positively significant to the probability of adopting IFRS.

5 RESEARCH CONCLUSION

The study followed a systematically step-by-step research process described in Saunders’ research onion. That was a helpful guide to a logical and systematic process to conclude.

Within the context of the decision-usefulness theory, the study concluded that IFRS adoption in African countries promotes FPI inflows. This is in line with why IFRS was developed, i.e., to meet the need of capital market participants purposely. As IFRS enhanced company financial statements, it became more useful to foreign portfolio investors to make better-informed decisions. As two-thirds of African countries' authorities did not adopt IFRS yet, the results of this study may encourage them to consider such an adoption strongly. In conclusion, policymakers in African countries should note this study's results. Therefore, policies to monitor listed firms' activities and enforce compliance with IFRS rules and regulations are warranted.

6 CONCLUDING REMARKS ON THE RESEARCH PROCESS

Data were only available for 35 countries out of 54 sovereign African countries. This constitutes a concern in generalizing the findings. Nevertheless, the findings of the sample countries can be inferred from the rest of the African countries. IFRS was developed purposely to meet the need of capital market participants. However, contrarily, the capital market in Africa is underdeveloped, with few listing securities. This poses a challenge in determining the efficacy of IFRS in preparing the financial statement to attract FPI.

Concerning the study's practical experience, IFRS adoption makes the accounting information more reliable, transparent, comparable, and credible. The adopting countries were able to experience more flow of FPI than the non-adopting IFRS countries. Therefore, foreign investors shift their capital to the IFRS-adopting countries as evidence that their FPI is improved. The study area of focus is vital to the accounting literature and can potentially contribute to African policy formulation.

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Determining the Impact of Different Forms of Stationarity on Financial Time Series Analysis

Jan van Greunen and André Heymans 

1 INTRODUCTION

The aim of this chapter is to explore the research process followed in determining the impact on research results when making use of the wrong form of differencing procedure when attempting to render non-stationary data stationary. This is a phenomenon that occurs on a regular basis and to tackle the problem scientifically a sound research process is needed. So, to ensure a rigorous research approach, Saunders et al's. (2019) research onion is explored as the framework employed to structure the research.

The research onion starts by demarcating the main philosophy the research will follow. As such, the research philosophy directs the study according to a specific world view, and all results and conclusions will

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naturally be interpreted within the bounds of this view of reality. Once, the research philosophy has been demarcated the approach to theory development can be implied, as it dictates the reasoning to be followed when making assertions about the results of the study. The next layer of the research onion leads the researcher to decide on the methods and strategies to be followed in the quest to solve the research problem identified in the study. During this part of the research process, it is prudent to accurately define the research question that would provide a solution to the problem if properly answered. The methods and strategies to be followed naturally flows from the research question and guides the researcher to the formation of research goals. When the methods and by implication the research goals have been defined, the final step is to define time horizons, thereby directing the techniques, procedures of data collection and analysis to be followed.

In the light of the research framework above, the researchers had to start with an assessment of the data typically used in economic and finance studies. The bulk of the data used in finance studies take the form of time series data (longitudinal in nature). Because the data in each of the tests performed here reveal their own statistical properties, the researchers viewed it as *posteriori*. An optimal procedure to render non-stationary data stationary does exist and a positivist research philosophy, therefore, suits this research the best. The epistemological stance was that this knowledge can be measured and that the problem could only be solved through empirical investigation. The results were, therefore, interpreted deductively.

Since the crux of the research was to investigate the nature of the types of time series data that is often used in financial and economic modelling, the choice of data (methodological choice) was naturally quantitative in nature. The majority of financial time series data is non-stationary in its original state. A non-stationary time series refers to a process whose statistical properties change over time, and therefore, contains a unit root, being integrated to an order of n (Maddala & Kim, 2000). When regression analysis is done using such non-stationary time series data, the results are nonsensical or spurious (Granger & Newbold, 1974). These spurious results provide high R-square (goodness of fit) estimates and low Durbin-Watson statistics, and consequently, create the illusion of accuracy and robustness, but are in fact not significant (Gujarati, 2006). To overcome the problem of spurious regressions, the standard practice is to render the data stationary before they can be included in any regression analysis.

According to the literature, data can take one of two forms of stationarity; strict stationarity and covariance stationarity (Asteriou & Hall, 2007; Maddala & Kim, 2000; Montgomery et al., 2008). A strictly stationary time series' properties remain unchanged regardless of the time period selected within that specific time series (Fielitz, 1971), while a covariance stationary time series should have a mean, variance and covariance that remain constant over time (Enders, 2010). In econometric modelling, covariance stationary data is the most common form of stationary time series, and in general, when stating that a time series is stationary, it is in fact covariance stationary. Since most time series data are non-stationary in its original state the econometrician and data analyst are required to make the data stationary before embarking on any econometric analysis in order to avoid spurious results.

Although there are several different ways to render a non-stationary time series stationary, few econometricians and data analysts look at the statistical properties of the data they are using before they proceed with an optimal differencing process. It has become practice to achieve stationarity by simply following a first difference approach when transforming time series data in this manner. The first step the researcher follows is therefore not a proper analysis of the nature of the data, but a simple test to see whether the data is non-stationary—that is—whether it has one or more integer unit roots. Financial time series have been found to be inherently non-stationary and integrated to the order of $I(n)$ with n taking on the value of an integer. The value of n indicates the number of times it is required to difference a non-stationary time series in order to reduce it to stationarity (Burke & Hunter, 2005). Therefore, when a time series is $I(1)$ it is first differenced and becomes difference stationary and, when a time series is $I(2)$ second differences are taken and the series becomes difference stationary. However, not all time series are integrated to an integer order.

The first difference approach has become popular mainly because of the work of Nelson and Plosser (1982), who argued that many microeconomic time series are difference stationary and not trend stationary. The flaw in this approach is that data might have fractional roots. As a result of Nelson and Plosser's (1982) findings, a large section of the research community has taken to simply taking the first difference of a non-stationary time series, obtaining a stationary time series, using a unit-root test to confirm stationarity and to continue with modelling.

However, in cases where a time series is differenced more than once, while only being integrated to the order of one, the time series becomes over-differenced (Dagum & Giannerini, 2006). An over-differenced time series is stripped of its statistical properties and is consequently of little to no use during econometric modelling (De Jong & Whiteman, 1993; Plosser & Schwert, 1977). Besides being integrated to the order of an integer, a time series can also be fractionally integrated and denoted as being $I(d)$ where the fractional integration or fractional difference parameter d denotes a non-integer value.

In cases, where a time series is differenced once while being a fractionally integrated time series (where $0 < d < 1$) it too will suffer over-differencing (Gil-Alana, 2006). If the time series in question is, however, fractionally differenced, it would produce a fractionally differenced stationary time series that has not been over-differenced, maintaining its statistical properties (Burke & Hunter, 2005).

Since first differencing has become such a popular method of achieving stationarity, it is possible that some of the financial time series that are being first differenced could be fractionally integrated. Also, fractional differencing is only one alternative method of obtaining a stationary time series. Other forms of stationary time series include trend stationary, seasonal stationary and cyclical stationary time series (Burke & Hunter, 2005; Enders, 2010; Montgomery et al., 2008). This suggests that some of the data used in financial econometric analysis are over-differenced, providing results and inferences that are less accurate than expected.

Therefore, in order to address the research problem posed here, statistical analysis was applied to reach the research findings. To ensure the correct statistical analysis was applied, the researchers verified the techniques from the literature by means of a thorough literature review. The remainder of the chapter covers the research problem, research design, the evidence and the conclusion.

2 RESEARCH PROBLEM AND RESEARCH QUESTION

Since a considerable amount of time series data are in fact fractionally integrated, there exists a real danger that many research studies arrive at inferior results because of over-differencing the data. Most econometricians and data analysts do not properly ascertain the statistical properties of the data before they proceed with the differencing process. Instead,

they test the time series for the presence of a unit root, and upon confirmation of the presence of a unit root in the data they simply take first differences until the time series is stationary. By following this “difference first and ask questions later” approach, they strip the data of all important information and statistical properties, rendering it useless for further application in econometric tests.

Although apparent, the research questions that follow logically from the stated problem is whether time series analysis with data made stationary using an inappropriate method lead to inferior results in terms of statistical significance and regression accuracy? Furthermore, could the use of data rendered stationary using the appropriate form of differencing provide a superior result when used in regression analysis?

To answer these questions, the researchers had to decide on the appropriate research design. This research design is critical to putting the results and findings into context, ensuring that the researchers’ view of reality do not in any way influence the outcome of the findings. The next section addresses the research design.

3 RESEARCH DESIGN

To address the research problem posted above, the research design must take the nature of the problem into account. As discussed above, Saunders et al’s. (2019) research onion is explored as the framework employed to structure the research. As such, this section will address the following layers of the framework: the research paradigm (3.1), research approach (3.2), the choice of methodology (3.3), the research strategy (3.4), decision of time-horizons (3.5) and the research techniques followed (3.6).

3.1 *Philosophies*

The research philosophy forms the basis of the research in that it demarcates the research in terms of ontology, epistemology and axiology. The ontology of the research defines the nature of reality as it is assumed by the researchers in their quest to solve the problem at hand, while epistemology defines the nature of knowledge, its sources or facts and axiology defines the values, beliefs and ethics of the research. To decide on the appropriate research philosophy, the researchers, therefore, had to

take account of the ontology, epistemology and axiology of the field the research was conducted in.

When considering the ontology to be assumed for the research at hand, it is imperative that the nature of reality is first discovered before proceeding. The research covered here is the endeavour to determine whether researchers that make use of historical time series data perform the correct methodology when rendering the data stationary for further use. Since the data collected in time series data reflect buy and sell prices for anything from debt instruments to stock prices or reflect an aggregation of index values—as in the case of inflation—the data, and by extension the statistical properties of the data, reflects a single economic reality. Any results in this form of enquiry will lead to definite answers that can and should be interpreted objectively.

When considering the epistemological aspect of the study, it is assumed that knowledge can be measured and that the data, and by extension the nature of the problem, dictates that all conclusions drawn from the interpretation of the results must have its origins in the statistical properties of the data. After these transactions are concluded and then recorded, the data is immutable, and any enquiries into the statistical properties of such data is measurable. As measurability is a characteristic of an objective approach to research (no human interpretation is necessary), the epistemology points to that of the positivist view of reality. Finally, when considering the axiological aspect of the study, it was clear that adding to the current body of knowledge is not only valuable for the purposes of this study, but for the entire research community.

Given the description above, this research was approached from a positivist philosophical standpoint. Positivist research takes the view that knowledge exists outside of what is being studied, and by definition it can therefore only be done objectively. The research cannot include the opinions or personal viewpoints of the researchers and there is no need for any subjective interpretation of the results. All knowledge is viewed as a posteriori knowledge, meaning that the findings and conclusions drawn from the results are based in observation only.

3.2 *Research Approach*

When researchers make use of time series data to model economic outcomes, they make use of a standard set of econometric models. All these models pose a relationship between some variable and a number of

other variables. As such, one variable is always conjectured to be influenced by several seemingly independent variables that are used to explain or predict the value of the dependent variable.

However, because of the real-world relationships between different economic actors, it is not possible to extract any valuable information from these relationships as they often have common causes. This makes it impossible to sensibly extract value from these relationships without first transforming the time series values (which represents real underlying economic information) in such a way that the common drivers of these data series are neutralized.

Neutralizing the common drivers found in both the dependent and independent variables also takes researchers down a standardized objective path of investigation, and as such will lead them to observe results, rather than interpreting them. It is only logical that any research about the validity of these methods would in itself require the researcher to take a deductive approach as the aim of this research is to determine whether the current practice is correct.

A deductive approach starts with an existing theory, in this case that there is an optimal method to be applied when rendering non-stationary time series data stationary. This theory then raises a question—is there a statistically significant difference between results obtained from regression analysis performed with correctly differenced data as opposed to using incorrectly differenced data? Finally, data is collected in order to answer this question.

3.3 *Choice of Methodology*

When considering the epistemological aspect of this study, it is clear that knowledge in the form of the statistical results can be measured. According to Bryman (1984), the term methodology refers to an epistemological position that indicates different levels of analysis. When considering the analysis to be performed for the purposes of this research it was important to determine how knowledge were to be measured.

Therefore, to effectively address the problem identified in this study, the null-hypothesis posed was that a significant number of time series are integrated to some fractional order instead of being integrated to an integer order— $I(1)$ or $I(2)$. A rejection of this hypothesis would imply that current practices by researchers in the field of finance and economics are correct to take first or second differences to render their

data stationary. Because this hypothesis could not be rejected, a further hypothesis had to be tested. The second or sub-hypothesis posited that regression results can be improved (the explanatory power of regression analysis would be better) if the correct form of differencing is applied to render non-stationary data stationary. To find out whether this is the case, a number of time series had to be tested for the level of integration. Once the level of integration is known, the data would be rendered stationary using the first difference approach as well as the other statistical approaches available. The data rendered stationary by means of the different approaches were then used in forecasting models and compared to see which rendered the best results. For results to be regarded as superior, it had to provide a better forecast than the results achieved when using the data rendered stationary by means of another approach.

Therefore, to successfully test both these hypotheses, a quantitative research method was used. The quantitative research method is ideal for testing a theory comprising variables and then analysing trends by means of statistical tools (Creswell & Guetterman, 2018). It is also logical that a quantitative approach should be followed because this is also the basis of the research that is being scrutinized in this study.

3.4 *Research Strategy*

The possible research strategies identified by Saunders et al. (2019) includes action research, archival research, running case studies, ethnography, performing experiments, grounded theory, performing surveys and narrative inquiry. The research strategy followed in this study was strongly influenced by the nature of information as identified by the positivist philosophy adopted here. Secondary data were collected in the form of economic time series data. Because these are existing data series, the researchers were not able to influence the data in any way, making it quantitative *ex post facto* research.

3.5 *Decision of Time Horizons*

When it comes to the choice of time horizon, Saunders et al. (2019) identifies two options: time series and cross-sectional design. The researcher would employ a cross-sectional design when information relating to different data points are being investigated at a specific point in time to highlight differences in the data points. On the other hand, time series

analysis covers the same variables over consecutive time frames (Bryman et al., 2019). The researchers had to make use of time series data for this study, the reason being that the research being critiqued in this study was all making use of several economic and financial variables. All of these time series data sets are time series.

3.6 *Research Techniques*

When considering the research techniques to be followed, a number or steps are key. First, the researcher must decide what data are to be collected, and how to collect that data. Second, what models or techniques will be used for analysis of the data in attempting to answer the research question. Finally, the researcher will have to decide on the process to be followed when modelling the data. These steps are discussed in detail below.

Data Collection

The empirical data used for this quantitative research were retrieved in the form of daily price observations from the JSE as well as monthly observations from statistics South Africa. The data and by extension the results are not specific. This was done intentionally as the objective of this study was to test whether researchers in the fields of economics and finance handle the process of rendering non-stationary data stationary correctly or not.

The data used are the time series of the following financial and economic variables: (i) the daily closing values of AngloGold Ashanti Ltd. (ANG); ABSA Bank Ltd. (ASA), Nedbank Ltd. (NED); Anglo Platinum Ltd. (AMS); Wool-Worths Holdings Ltd. (WHL); JSE all share index (ALSI); the South African Consumer Price Index (CPI); and the daily realized South African Rand/United States Dollar (ZAR/USD) exchange rate. The sample period chosen for each time series stretches from 9 October 2006 to 7 October 2011 and includes 1253 observations per variable for the daily observations and 61 observations for the monthly figures. These time series were selected randomly since the only important factor is that the time series is financial or economic in nature.

Model Choice

The research aims to provide clarity on the form of differencing to be used when rendering data stationary. This was achieved by first determining which form of stationarity is present in the data. These include: (1) difference stationarity; (2) fractionally differenced stationarity; (3) trend stationarity; (4) cyclical stationarity; and (5) seasonal stationarity.

In testing the hypothesis that a significant number of time series are integrated to some fractional order and not an integer order, all the data were made stationary by taking first differences as well as the appropriate form of differencing for that dataset. In order to determine which of the forms of differencing rendered superior results—that is, testing the second or sub-hypothesis, all resultant datasets were used in forecasting models. To reject the sub-hypothesis, there should not be a statistically significant difference between the forecasting results achieved by employing the correctly differenced data versus data rendered stationary by simply taking first differences.

An important factor in rendering a time series stationary is to determine the presence of a stochastic trend, deterministic trend, unit root, cyclical component or seasonal component. In the case of determining the presence of a stochastic trend or unit root, the econometrician and data analyst must follow the differencing method for achieving stationarity. However, should a time series display a deterministic trend, the data must be de-trended and then tested for stationarity before any differencing can take place. A time series containing a cyclical component can be de-trended by using the Hodrick-Prescott (HP) filter or Baxter-King (BK) filter to determine whether the series is cyclically stationary (Baxter & King, 1999; Hodrick & Prescott, 1997). A seasonally stationary time series can be achieved by removing the seasonal component from that time series by means of seasonal differencing.

After a financial time series has been rendered stationary, it is necessary to confirm stationarity through tests. The popular tests available that have a unit root as null-hypothesis with stationarity as an alternative are the Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF) and Dickey-Fuller GLS (DF-GLS) tests (Asteriou et al., 2007). Econometricians can also use the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test with the null-hypothesis being that of stationarity (Kwiatkowski et al., 1992). It has been suggested that econometricians and data analysts should use the KPSS test in conjunction with one of the unit-root tests as a confirmatory analysis when testing for the presence of stationarity.

Modelling Process

The process followed to address the research question starts with the data in their raw form, testing whether the financial time series are stationary using the ADF and KPSS tests. The time series are tested for stationarity using the three different ADF-test equations and the two different KPSS test equations. When estimating the ADF test, while not including an intercept or trend, one of the following may occur. The null-hypothesis is rejected and the series deemed stationary in levels around a zero mean, or the null-hypothesis cannot be rejected, indicating the presence of a unit root.

In the case of the data being strictly stationary, modelling may continue without any further transformation of the data. In the case of the data not being strictly stationary, it is necessary to continue using the second ADF test and the first KPSS test. When an intercept is included when conducting the ADF and KPSS tests, the following may occur. The null-hypothesis might be rejected in the ADF test but not in the KPSS test. If this happens, the data are considered stationary around a constant mean, allowing the researcher to continue with the modelling process. Alternatively, the null-hypothesis cannot be rejected in the ADF test and is rejected in the KPSS test. The researcher should then conclude that there is a presence of a unit root in the data and that it is necessary to continue using the third ADF regression equation and the second KPSS regression equation.

When conducting the ADF and KPSS tests with an intercept and trend in the regression equations, one of the following situations may play out. The null-hypothesis is rejected in the ADF test but not rejected in KPSS test, meaning that the data are stationary around a constant mean with a deterministic trend. This should be confirmed using the DF-GLS test while including an intercept term in the regression equation (Maddala et al., 2000). The DF-GLS test offers two regression equations; one including an intercept term and the other includes both an intercept term and a trend. The inclusion of an intercept term in the test equation allows testing whether the time series is stationary around a constant mean (μ) where ($\mu \neq 0$). This leaves the time series de-trended.

In the case, where the null-hypothesis is rejected while an intercept term is present, the time series is considered trend stationary. This must be confirmed using ADF and KPSS. In this case, the data must be de-trended and tested with a repeat of the ADF and KPSS tests (including an intercept term), before modelling can commence. If the null-hypothesis

of the ADF test is rejected and the null-hypothesis of the KPSS test cannot be rejected, the time series is trend stationary. If the ADF test's null-hypothesis cannot be rejected but the KPSS test's can, the data is still non-stationary.

It is also possible to include an intercept and trend in the DF-GLS regression. Rejecting the null-hypothesis in this instance will require the econometrician to de-trend the data first as it is trend stationary. In the case of not rejecting the null-hypothesis, the econometrician may move to differencing methods. Therefore, only after following the whole process up to this point, may the econometrician start with the correct form of differencing.

To render data stationary, it can be differenced in one of two ways; taking first differences or taking fractional differences. It is critical to continue with the process of testing for stationarity by conducting both differencing methods and comparing the fractional integration parameters of both. This comparison will allow the econometrician to decide on the correct form of differencing to perform. The Geweke/Porter-Hudak (GPH) method is used to determine the fractional differencing parameter used to obtain a fractionally differenced time series (Geweke & Porter-Hudak, 1983).

In the case of fractionally integrated data series, when conducting the ADF test (without an intercept or trend), the following may occur. The null-hypothesis is rejected and the series considered first difference/fractional difference stationary around a zero mean, or the null-hypothesis cannot be rejected, thus indicating the presence of a unit root. If the data is first difference/fractional difference stationary modelling can continue without further transformations. Alternatively, the second ADF and the first KPSS regression equations should be run to determine the next step. If the tests are run while including an intercept in the regression equations, one of the following results may occur. The null-hypothesis is rejected in the ADF test but not in the KPSS test, or the null-hypothesis cannot be rejected in the ADF test but is rejected in the KPSS test. In the former case, the series is deemed first difference/fractional difference stationary around a constant mean, while the latter indicates the presence of a unit root.

In the case of stationarity, the calculation of the fractional differencing parameter is required before continuing with the analysis. The comparison of the fractional differencing parameters is necessary for determining which time series are to be used in further modelling. In the

case of non-stationarity, the econometrician should use the third ADF regression equation and the second KPSS regression equation while including an intercept and trend in the regression equations. Should the null-hypothesis be rejected after the time series has been first differenced/fractionally differenced, it is proof that a trend is still present in the data. In the unlikely event of this occurring, the time series must be de-trended, re-tested and the results confirmed with the ADF and KPSS tests.

Once this battery of tests is concluded the econometrician would be able to report whether the time series under consideration is in fact first difference stationary, fractional difference stationary or trend stationary. Any resulting, analyses performed after the conclusion of this process will yield more accurate and statistically significant results.

4 RESEARCH EVIDENCE

The research process developed here focused on, and was led by, the underlying statistical properties of the data. To test the main hypothesis—that a significant number of time series are integrated to some fractional order and not an integer order—the research process described under Sect. 3.6 was performed on all the data. The following results show that one of the time series was trend stationary; four of the time series were first difference stationary; five time series were over-differenced after being first differenced; and the majority of the time series were fractional difference stationary.

When considering the research question—whether the use of data rendered stationary using the appropriate form of differencing provides a superior result when used in regression analysis, the following results were reported. All the time series that were found to be fractional difference stationary outperformed their first difference forms in forecasting tests, while all first difference stationary series outperformed their fractional difference stationary counterparts when forecasting. The results confirmed that it is imperative that the statistical properties of the specific data series be determined before deciding on the actions to be taken.

It is therefore clear that the assumption that most time series are first difference stationary is not always true. Researchers should practice due diligence and allow the statistical properties of a time series to lead them in rendering the series stationary. This will prevent the occurrence of

over-differencing and improve the empirical results of any econometric endeavours of the researcher.

5 CONCLUSION

The first step researchers often perform is normally to determine the statistical properties of the data they are working with. One of the tests that are performed in the process is a test for stationarity. Because the majority of economic and financial time series data are not stationary in level format, the next logical step is to render the data stationary by some transformational process.

To test whether this approach is valid, the researchers performed an extensive archival study of a wide variety of studies that make use of economic and financial time series data and found that in all cases investigated, these studies simply followed a first difference approach to render the data stationary. To test whether these studies were justified in their approach to use a first difference process, this study followed an experimental approach. A wide range of economic and financial data series frequently used in similar studies were tested for their appropriate form of integration. Upon deeper investigation it was found that the majority of these time series were not first difference stationary, but instead required other methods to render the data properly stationary.

The results were tested for the efficacy of the methods used by using the newly stationary data in comparative regression analyses. The same time series data were rendered stationary by means of a first difference approach (as is the common practice among academics) and was used in the same forecasting tests. The results confirmed that the appropriately differenced data outperformed other forms of the data in all instances.

6 PRACTICAL EXPERIENCE/ISSUES

Although the study attempted to cover a variety of time series, it is true that the data is not a strictly representative sample of all possible economic and financial data available. The researchers did however aim to choose data keeping maximum diversity in mind. As the aim was to prove a concept, rather than finding the statistical properties of specific time series data, the time series that were included represented not only price data, but also index values and growth rates. This is important because the high

pressure on the academic fraternity to publish or perish forces researchers to take mental short cuts in their research approach.

This research shows that the moment one accepts the research findings of others you run the risk of not doing your own due diligence. The data series picked for this research are used in countless other studies. The researchers could, however, not find any examples where the order of integration of the data being used were interrogated, and in all the cases where these time series data were used, the assumption was made that the data was integrated to the order one. Researchers should take care when they are working with time series data. The current “difference first and ask questions later” approach will lead to inferior results if the results of this study holds true for the majority of economic and financial time series data used in research. The researcher should not be led by current practices as advocated by mainstream research but should do “their own research” and therefore be led by the statistical properties of the data. The statistical properties of a non-stationary time series are therefore the only criteria that should be considered when deciding on whether the data must be first differenced, fractionally differenced or de-trended to render it stationary before using the data in any further analysis.

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Measuring the Relationship Between Intraday Returns, Volatility Spillovers, and Market Beta During Financial Distress

André Heymans  and *Wayne Brewer*

1 INTRODUCTION

This chapter delves into the research process followed during the investigation into the construction of an efficient investment portfolio. Constructing an efficient investment portfolio is critical for pension funds, mutual funds, and hedge funds alike. Although this is an academic pursuit, it is very much based on the practical application of sound investment principles, and therefore of practical use in the investment industry. The researchers, therefore, took care to follow a rigorous systematic research process to ensure that the results could be replicated by fund managers.

To achieve the necessary academic rigor, Saunders et al.'s (2019) research onion was used to inform the research process. The research

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onion is a great tool that ensures that the researcher follows a logical process from the conception of the idea to the conclusion of the study.

Tackling the problem that portfolio managers face when attempting to construct an efficient portfolio is challenging. The current theories applied in the space are well established and attempts to improve on the way things are done is often met with fierce resistance. An example of this is modern portfolio theory (MPT), which serves as the basis of all investment portfolio construction. MPT has its origins in the work done by Markowitz (1952, 1956, 1959), and from this Treynor (1962), Sharpe (1964), and Mossin (1966) developed the Capital Asset Pricing Model (CAPM). As the model's name suggest, it is used to determine the price that an asset should trade at. The price of an asset is however directly linked to the risk of owning the asset, so a measure of risk is needed to improve the accuracy of the model. This risk measure was adopted in the form of market beta which can be expressed as the covariance between the return on an asset and the return on the market portfolio.

Modern portfolio theory (MPT) has long been placing emphasis on using market beta as a risk measure in constructing an efficient portfolio. This is such a simple procedure that beta has seen substantial integration into modern-day portfolio management. Not only is it straightforward to implement, but portfolio managers have also been encouraged to run well-diversified portfolios under the assumptions of the efficient market hypothesis (EMH). Doing this will ultimately lead to the construction of a portfolio with a unit correlation with the market (a beta of one), and therefore, considered entirely hedged against unsystematic risk. Although the quest for a unit-beta portfolio does allow for sufficient diversification when compared to the broader market, beta itself is an imperfect measure of all the relevant information pertaining to stock selection and allocation. Beta has, for example, been known to be an unstable measure when it comes to stock market anomalies, and it is only an effective measure of mean returns between stocks—not providing details about the other statistical moments (Kaminsky & Reinhart, 1998). Despite the advantages of full diversification in accordance with beta, systematic risk remains present. In this regard, the volatility within stocks still adds to the portfolio's risk profile while remaining a challenge for the profitability of the portfolio.

Given the shortcomings of beta, portfolio managers in smaller economies such as South Africa face even higher risk. Because of the

limited choices of stocks, it becomes increasingly difficult to fully diversify a stock portfolio given volatility spillover effects between stocks listed on the same exchange. In cases like these, relying on beta alone to construct a portfolio may lead to substandard portfolio returns, something that might be negated if one considered the impact of volatility spillover effects during portfolio construction. This is especially acute when considering that stock market anomalies are a known cause of serial correlation in returns (Fama, 1965). Where markets are proven to be inefficient to a large extent, beta becomes an ineffective measure of risk which leads to substandard portfolio construction. This is important since market dynamics are constantly changing and are therefore never perfectly informationally efficient (Grossman & Stiglitz, 1980).

Because information about market structures is ever changing, and information regarding these changes is costly, current asset prices do not always perfectly reflect the available information. These information asymmetries then cause volatility as buyers and sellers often hold different information sets leading to advantages to one or the other party. In order, therefore, to effectively hedge portfolio risk, it is important to consider all sources of asset volatility, and the way in which volatility is transmitted between assets.

When considering that the arrival of new information leads to an increase of volatility within securities, one can reasonably expect volatility to be transmitted between assets as well. It is then also reasonable to assume that the spillover of information from one market to the next will lead to volatility spillovers between stocks. This can easily be seen in the volatility patterns of stocks throughout the trading day (Wood et al., 1985).

From these observations, both from practice as well as the literature the researchers in this study were cognizant of the fact that there are other means of incorporating risk during the portfolio construction process. It is therefore clear that even though beta is often favored as risk measure, it is too simple a tool to capture the finer nuances of the risk picture during portfolio construction and rebalancing. To improve the risk weighted return of portfolio managers, this research, therefore, suggests the adoption of additional risk measures when considering the addition of individual stocks in the portfolio.

2 RESEARCH PROBLEM AND RESEARCH QUESTION

After the seminal work done on MPT and the CAPM portfolio managers adopted a unit-beta approach to fully diversify their portfolios. However, in cases where market anomalies occur, beta fails to capture all the relevant information concerning stock selection and allocation. Beta is also limited in that it only provides insight into the mean returns between stocks (Longin & Solnik, 1995).

The challenges portfolio managers in smaller markets face are even greater. Because of the limitations they face in their choices of stocks, it is difficult to fully diversify a stock portfolio. This is especially problematic when considering volatility spillover effects between stocks that are listed on the same exchange. In cases like these, a portfolio constructed to track the index might be inferior because the risk measure, beta, does not capture the risk dynamics between stocks, leaving the portfolio vulnerable to systematic risk.

The primary question that follows from the problem identified above is whether it would be possible to identify any volatility transmission among stocks in a portfolio on a microstructure level. The secondary question that follows the first is whether this transmission measure provides meaningful information over and above that which can be deduced from beta for the purpose of rebalancing a stock portfolio?

To answer these research questions, it is critical that a suitable research design is used to place the results into context. This will ensure that the researchers' view of reality does not distort the outcome of the findings. The next section will focus on the research design.

3 RESEARCH DESIGN

To answer the research questions posed for this study, the researchers based the structure of the research on Saunders et al.'s (2019) research onion. This structured approach helps the researcher to process information in a systematic way, thereby ensuring that all aspects of the research process are executed correctly.

Section 3.1 will discuss the layers of Saunders et al.'s (2019) research framework starting with the research paradigm. Thereafter, the research approach is discussed in Sect. 3.2, the choice of methodology in Sect. 3.3, the research strategy in Sect. 3.4, and the decision of time horizons over

which the data is considered is discussed in Sect. 3.5. Finally, a discussion of the techniques used is discussed in Sect. 3.6.

3.1 *Research Philosophy*

When approaching the research from a philosophical standpoint first, the other layers of the onion flows logically from it, as it is the lens through which the world is viewed, and as such it will shape all results and conclusions that flows from the research. Although there are many ways in which one can think about the research philosophy, three ways stand out in the literature; epistemology, ontology, and axiology (Saunders et al., 2019).

When looking at the research from an epistemological view, the researchers have to decide on what constitutes acceptable knowledge based on the form the data collected for the study. Because the data collected for this study takes the form of intraday prices of stocks, it cannot be changed or influenced by the researchers. Since the statistical properties of the data are measurable and these properties are the single factor to be considered when conclusions are drawn from the results, the epistemology points to a positivist view of reality.

Considering the research philosophy from an ontological point of view, the researcher must decide on the nature of reality as it raises questions about the way the world works (Saunders et al., 2019). Since the objective of the study is to determine whether portfolio optimization can be improved by adding another dynamic to the established practice in the form of volatility spillover effects, the researchers will use historical time-series data in the form of intraday stock prices. Because the data collected in time-series format reflect buy and sell prices for stocks, the data as well as its statistical properties reflect a single economic reality, and consequently all conclusions drawn from the results should be interpreted objectively.

The final philosophical consideration is the axiological aspect of the study. During this phase of the process, the researcher makes judgements about value. The researcher's value system plays an important role in all the subsequent stages of the research process and determines the credibility of the research results to a great extent. Because the researchers in this study made use of secondary data collected from a data aggregator (the JSE), the ethical considerations were muted.

This research was approached from a positivist philosophical standpoint when considering the epistemology, ontology, and axiology discussed

above. The researchers took the view that knowledge exists independently of the views of the researchers, and it is therefore not influenced by external factors. Ontologically speaking, the topic was considered objectively since better risk weighted returns are not a subject of opinion but determined by objective measurement. All knowledge is posteriori knowledge as findings and conclusions are drawn from the results which is based in observation only.

After defining the research philosophy, the next step is to decide which research approach will be followed as it dictates how results will be interpreted. Section 3.2 discusses the research approach.

3.2 *Research Approach*

The second layer of Saunders et al.'s (2019) research onion comprises the approach the researcher is taking and can take the form of an inductive, deductive, or abductive approach. With inductive reasoning, the researcher is looking to obtain probable evidence from specific but limited observations. Conclusions are therefore drawn from the data which allows for broad generalizations to be made from specific observations. A deductive approach is one where the researcher starts with a broadly defined hypothesis from which a specific, logical conclusion is drawn. An abductive process is followed when the most likely conclusion is drawn from the observed facts. Looking at the type of research performed here, a deductive approach was employed. This process aims to prove the causal links between variables (Saunders et al., 2019), in this case the link between volatility spillover effects and portfolio risk. It should, therefore, be clear that this investigation flows naturally from the positivist philosophy that posits that knowledge exists outside the subject being researched.

3.3 *Choice of Methodology*

The methodology of a study refers to an epistemological position that indicates different levels of analysis (Bryman, 1984). As mentioned before, the data for this study was collected in the form of intraday returns from the JSE, and the researchers cannot influence the results obtained from the data in any way. Epistemologically speaking, the research follows an objective approach in that the data and all statistical properties of the data are measurable. It should be clear that this stance guides the

research as to the choice of methodology and by extension the nature of the problem to be solved.

The problem identified in this study is that the current measure of risk—beta—is not sufficiently suited for the optimal construction of a stock portfolio in a country with a small number of stocks. To solve this problem, the researchers developed a hypothesis that can be tested by means of a deductive process. The hypothesis is that it should be possible to improve the risk weighted return of a stock portfolio by adding another risk measure to the equation. This risk measure comes in the form of a tool that considers the volatility spillover effects between stocks which then indicates whether certain stocks should be avoided when constructing an investment portfolio of stocks.

Given the philosophical viewpoint and the research approach discussed above, the researchers followed a quantitative research method. This approach is especially appropriate in cases where variables can be quantified and inferences can be drawn from samples of a population (Queirós et al., 2017). Because this study makes use of intraday stock returns data, this research methodology is ideal for testing the hypothesis set out above.

3.4 *Research Strategy*

According to Saunders et al. (2019), there are several research strategies the researcher can follow. These include experiments, case studies, surveys, action research, archival research, narrative inquiries, and grounded theory. Because of the nature of the research problem in this study, an experimental approach was followed. The aim of experiments is to determine whether there are causal links between variables. These links are typically observed as a change in a dependent variable because of a change in an independent variable (Hakim, 2000). In this case, the causal link between a portfolio's risk weighted returns using beta as the sole risk measure were compared to a portfolio's risk weighted returns using beta and volatility spillover effects as risk measures. Based on this comparison, any difference between the experimental and control groups is attributed to an intervention.

3.5 *Decision of Time Horizons*

When considering the time horizon for the data, Saunders et al. (2019) states that the researcher can choose one of two options. The first option

is to make use of cross-sectional data. In this format, the researcher will investigate different data points at a specific point in time. This is done to show how the data points are similar or different at that point in time. The second option is to make use of time-series data. When making use of time-series data, the investigation is performed on one variable over consecutive time frames (Bryman et al., 2019).

Because the problem identified in this study is that the popular risk measure—beta—is not sufficiently suited for the optimal construction of a stock portfolio over time, the researchers opted for the use of time-series data. All the stock price variables used in this study, including the proxy stocks that were generated based on their statistical properties, are in time-series format.

3.6 *Research Techniques*

The research techniques followed by the researchers are critical to the success of the study. Using an inappropriate process or model will skew or in some cases totally misrepresent the real findings. To ensure that the correct process is followed, the researcher must keep several steps in mind. The first and probably most important step is to determine what data should be collected. This is a rigorous process during which current and historical literature is consulted to determine whether the intended data is appropriate. Using the wrong data will compromise the result.

The second step is to determine how the data will be collected. Again, how the researcher goes about the collection process is important as it can have an influence on the result. Once, the data has been collected, the researcher must decide on the models or techniques that will be used for analysis. Using one model over another cannot be left to chance, and significant research is necessary to ensure that the appropriate models or techniques are used.

During the final step the researcher will have to make a choice about the process to be followed when modeling the data. Following the wrong sequence of modeling procedures can again lead to critical shortcomings in the interpretation of the results.

Data Collection

The data used in this study consists of intraday stock returns from five stocks listed on the JSE. These stocks are Anglo-America (AGL), ABSA (ASA), Bidvest (BVT), SABMiller and Sasol (SOL). Because the data were

collected as tick data,¹ the stock price of each of these stocks was refined down to hourly prices for each trading day. Since a snapshot was taken on the hour at every hour from 09:00am to 05:00 pm, there are eight data points per trading day. The hourly prices were then converted into hourly returns by recording the change in price from one data point to the next. The data were collected for a period stretching from the July 1, 2008, to the April 30, 2010. This single period was broken up into 10 shorter periods, each spanning two months. Each of the shorter periods were chosen at random. These periods provide a chance to capture volatility spillover effects for a period just before the Lehman Brothers bankruptcy on September 15, 2008, and the subsequent periods thereafter.

The data necessary for the calculation of the market beta is the JSE All-Share index (J203). Daily returns on the All-Share index were calculated using the closing value of the index of each day. For comparability, the same method is applied for estimating the returns for each stock in any given portfolio. The reason for using a daily calculated beta instead of a realized intraday beta is because the intraday version is less persistent and predictable (Andersen et al., 2006).

Model Choice

Deciding on the appropriate model is an important and complex process. Informing this decision, the researchers consulted the relevant literature on volatility spillover effects, portfolio construction, and market efficiency. To fully capture the volatility spillover effects, Nelson (1991) proposed the use of an Exponential Generalized Autoregressive Conditional Heteroskedasticity (E-GARCH) model. This specification improves on the standard ARCH-models because conditional volatility is formulated such that it expresses changes in price as a function of both the magnitude and direction of shocks (Samouilhan, 2006).

In optimizing the portfolio construction process, the researchers had to incorporate the E-GARCH model as part of an aggregate shock (AS) model. The AS model follows a two-step procedure. The purpose of the

¹ Tick data is the term used to describe the irregular intervals that stocks are bought and sold at. This is the most comprehensive recording of a stock's price history and includes all transactions registered for a particular stock.

procedure is to find the fitted values for e_t and h_t in Eqs. 1 and 2, respectively. These fitted values are then substituted into Eqs. 3 and 4, to find estimated equations. The alternative stock returns in each portfolio are specified as:

$$B_t = a_1 + \beta_1 AltS_{t-1} + e_t, \quad (1)$$

where B are the returns of an alternative stock within the same portfolio for period t ; $AltS_{t-1}$ is the returns on the alternative portfolio for the previous period and e_t captures the factors that affect returns not explained by the autocorrelation of the current period's stock returns with the previous period's stock returns (persistence or volatility clustering). In this configuration, e_t represents that part of a stock's returns that cannot be explained when considering available public information. The stock returns at the same period t can be specified as:

$$A_t = a_2 + \beta_2 S_{t-1} + \phi e_t + u_t, \quad (2)$$

where A are the returns of a stock within the same portfolio as the alternative stock. The coefficient ϕ measures the relationship between the returns on stock B and the returns on stock A . The error term e_t now represents the returns on stock B that cannot be explained for period t . To measure the level of volatility that spills over between stock B and stock A , and eliminate the potential “*curse of dimensionality*”² the researchers made use of a univariate E-GARCH (p, q) process. The error term e_t in Eq. 3 is assumed to be normally distributed with a mean of zero and a variance that follows an E-GARCH (p, q) process that can be expressed as:

$$\ln h_{B,t} = \varpi_1 + \delta_1 \ln h_{B,t-1} + \gamma_1 \frac{\varepsilon_{B,t-1}}{\sqrt{h_{B,t-1}}} + \alpha_1 \frac{|\varepsilon_{B,t-1}|}{\sqrt{h_{B,t-1}}}, \quad (3)$$

where the natural log of the conditional variance e_t in period t is a function of the time invariable mean reversion value, ϖ , the natural logarithm of the past conditional variance, $\ln h_{B,t-1}$, as well as the level of the standardized residuals, $\varepsilon_{B,t-1}/\sqrt{h_{B,t-1}}$, and absolute value of the standardized residuals, $|\varepsilon_{B,t-1}|/\sqrt{h_{B,t-1}}$. The subscript B denotes an alternative stock

² The relatively “smaller” amount of data allows for a parsimonious test, avoiding the large data sets that may render multivariate models impractical in empirical applications (McAleer & Veiga, 2008: 4).

(Stock B).³ Finally, it is assumed that the error term on stock A returns, $u_{i,t}$, is also normally distributed with zero mean and a variance that follows an E-GARCH (p, q) process denoted as:

$$\ln h_{A,t} = \varpi_2 + \delta_2 \ln h_{A,t-1} + \gamma_2 \frac{\varepsilon_{A,t-1}}{\sqrt{h_{A,t-1}}} + \alpha_2 \frac{|\varepsilon_{A,t-1}|}{\sqrt{h_{A,t-1}}} + \kappa_i h_{B,t} \quad (4)$$

The model specification of the variance of stock A in Eq. 4 includes an alternative stock (stock B) measure, $h_{B,t}$, allowing for explicit testing of the relation between stock A 's volatility and stock B 's volatility. The term $\kappa_i h_{B,t}$ in Eq. 4 refers to stock B 's conditional variance term and expresses the relation between stock A 's volatility and stock B 's volatility. By including the terms $\varepsilon_{A,t-1}/\sqrt{h_{A,t-1}}$ and $|\varepsilon_{A,t-1}|/\sqrt{h_{A,t-1}}$, it is possible to model the asymmetric volatility impact of past shocks if $\gamma_2 \neq 0$. Where $\gamma_2 < 0$, negative shocks (bad news) will have a larger effect on volatility than positive shocks (good news). When $\gamma_2 > 0$, positive shocks have a greater effect than negative shocks. The term $\delta_2 \ln h_{A,t-1}$ indicates the level of volatility persistence once spilled over.

Modeling Process

To measure the impact of volatility spillovers between stocks on the overall portfolio risk, the researchers created proxy stocks. Each stock within the portfolio was 'cloned' by means of a Monte Carlo simulation to take on the statistical properties of each of the original stocks during a given period. To successfully test the hypothesis, the proxy stocks should exhibit approximately identical returns and risk to the actual stock it replaces within the portfolio.

The number of observations for each two-month period ranges from 311 on the low end to 351 at the high end. This allows for an adequate number of data points to ensure that the statistical inferences drawn from the modeling process can be trusted. The maximum and minimum values of the stocks and their proxies can be used as indication of the volatility of each stock. These values are greater for the original stocks, indicating a greater likelihood of volatility spillovers occurring among the original stocks when compared to their proxies. This is better observed in the kurtosis for each of the stocks. The original stocks display leptokurtic distributions which is normal for stock price data (Alexander, 1961).

³ That is all the various alternative stocks included within the same portfolio.

Table 1 Illustrative statistical proxies: Descriptive statistics

<i>Descriptive Statistics</i>							
<i>Period 1</i>	<i>Obs</i>	<i>Mean (%)</i>	<i>Max. (%)</i>	<i>Min. (%)</i>	<i>Std. Dev. (%)</i>	<i>Skewness</i>	<i>Kurtosis</i>
AGL	343	-0.078	3.348	-4.614	0.970	-0.1720	5.1929
ASA	343	0.091	6.863	-4.639	1.145	1.0120	9.2248
BVT	343	0.043	3.770	-2.768	0.940	0.4506	4.6692
SAB	343	-0.023	3.483	-2.431	0.710	0.3865	5.8688
SOL	343	-0.025	2.977	-3.472	0.905	0.0580	4.4157
V_AGL	343	-0.078	2.794	-2.891	0.970	-0.1154	2.8590
W_ASA	343	0.091	2.827	-3.248	1.145	-0.0727	2.7424
X_BVT	343	0.043	2.798	-2.403	0.940	0.0034	2.7399
Y_SAB	343	-0.023	2.206	-2.292	0.710	0.0653	3.3386
Z_SOL	343	-0.025	2.334	-2.179	0.905	0.0430	2.6395

As expected, the proxy stock returns exhibit mesocratic distributions. Although the returns and standard deviation of the actual stocks and their proxies are the same, their distribution characteristics differ from the 4th moment onward. This can be seen in Table 1 which is an excerpt from the statistical properties of the stocks and their proxies over all ten periods.⁴

To ensure that the return and risk characteristics of the stocks and their proxies are as close to one another as possible, a stochastic process was used to simulate random returns which is normally distributed around a given mean (μ) and standard deviation (σ) given the probability p . The researchers opted for the simulation of proxy stocks because it is not possible to find stocks within a market that replicate another stock's mean and standard deviation that closely. This is critical to prove that volatility spillovers matter when constructing a stock portfolio.

To measure the impact of volatility spillovers, the mean and standard deviations of the original five-stock portfolio are measured in each of the test periods. One of the original stocks in the portfolio are then replaced with its proxy clone after which the portfolio mean and standard deviation are measured again. If the hypothesis holds true, there should be a noticeable difference in the portfolio variance as the original stocks are replaced with their proxies.

⁴ The original study covers 10 periods. Period 1 is inserted here for illustrative purposes.

4 RESEARCH EVIDENCE

To interpret the results, the researchers had to follow a deductive process. Since there is only the risk weighted returns of the different portfolios to consider, the interpretation of the results was done objectively based on the statistical properties of the data. Table 2 is an excerpt from the statistical properties of the original portfolio and the proxy portfolios over all ten periods. Only the first period is shown here as example.

Upon first observation, the returns of each of the proxy portfolios are identical to one another and the original portfolio. This is not surprising as each of the proxy stocks was simulated to mimic the returns and risk behavior of their originals. Since the returns between the original portfolio and their proxy portfolios are the same, the differences between the portfolios are captured by portfolio standard deviation and market beta. Periods two, three, and four coincides with the period hardest hit by the financial crisis of 2009, and as a result these portfolios all have negative returns. Period two coincides with the two months after Lehman Brothers were declared insolvent. The portfolios in period two, therefore, exhibit the highest portfolio risk.

When considering the market beta of the portfolios over all ten time-frames, only period four, exhibit portfolios with a beta greater than one. This signifies the start of normalization on the JSE to some extent. Since a higher beta signifies a greater exposure to market risk, it is also possible that the international exposure of some of the large cap stocks may explain the excess riskiness observed in the period four portfolios. The market shows recovery from period five onward as the observed portfolio returns are positive, the only exception being period nine. The volatility spike in

Table 2 Illustrative statistical proxies: Volatility measures

<i>Period 1</i>	<i>Volatility Measures</i>					
	<i>Portfolio</i>	<i>Portfolio V</i>	<i>Portfolio W</i>	<i>Portfolio X</i>	<i>Portfolio Y</i>	<i>Portfolio Z</i>
Standard deviation (%)	0.538	0.480	0.506	0.500	0.497	0.496
Return (%)	0.001	0.001	0.001	0.001	0.001	0.001
<i>Beta</i>	0.7005	0.4505	0.6992	0.5633	0.5739	0.6864

this period may be attributed to the irrational investor behavior caused by the Haiti earthquake.

Although the proxy stocks were simulated to have the same variance as their original counterparts, the original five-stock portfolio exhibits a larger portfolio standard deviation than their proxy portfolio counterparts. This is captured by market beta to a large extent. Since beta decreases in tandem with portfolio standard deviation (save for one period), the market exposure of that portfolio also decreases.

Although correlated, beta does not decrease linearly as portfolio standard deviation decreases. It is for this reason that beta is not sufficient as a risk measure, and volatility spillovers are considered as augmentation when constructing a stock portfolio. To incorporate the influence of volatility spillovers on portfolio construction, the study makes use of an AS model framework. This framework makes it possible to test the relationship between volatility and returns among the stocks in a portfolio. Tables 3 and 4 provide the AS model output (ϕ_i -coefficients in Eq. 2 and κ_i -coefficients in Eq. 4).

In table 3, the stocks and their proxies on the left represent the stock being analyzed for volatility spillover effects to the rest of the stocks in the portfolio. The first table represents the error term of the stock causing a spillover (the ϕ -coefficient in Eq. 2).

The error term is statistically significant for at least three of the four stocks in all the estimated AS model regressions for all the original stocks in each period. This is markedly different to the result obtained from the proxy stock replacements. When the proxy stocks are tested for the volatility spillover impact on the portfolio only one instance can be found at most. This proves that the returns of the proxy stocks are inconsequentially integrated with the returns of the other stocks in the portfolio. In each case, a proxy stock replaces a stock that exhibits statistically significant integration with the rest of the stocks in the portfolio. Although there is a reduction in the returns that spillover to the portfolio, the overall portfolio returns remain unaffected.

The more significant finding, however, was the impact of volatility spillovers as measured by the variance equation in table 4. The γ_2 -parameter in Eq. 4 measures the asymmetry or leverage effect of volatility. When the parameter has a positive sign positive shocks has a greater impact on the portfolio than negative shocks and vice versa. The results in table 4 show that this asymmetric measure is more significant for the actual stocks than for their proxy replacements in most cases.

Table 3 AS model results (mean equation)

Mean Equation		Coefficient of ϕ_i -terms										
Period		1	2	3	4	5	6	7	8	9	10	
V	AGL	ASA(c)	0.1383*	0.5428*	0.3947*	0.3292*	0.5951*	0.5122*	0.4711*	0.2800*	0.4137*	0.5074*
		BVT(c)	0.2294*	0.6521*	0.3367*	0.3381*	0.3931*	0.5740*	0.1793*	0.1480*	0.3376*	0.2522*
		SAB(c)	0.3956*	0.8852*	0.7305*	0.6721*	0.7225*	0.0797	0.3900*	0.2295*	0.2921*	0.6249*
		SOL(c)	0.4188*	0.6338*	0.7250*	0.7422*	0.6793*	0.7224*	0.5643*	0.3468*	0.6610*	0.4454*
ASA		ASA(c)	0.0535	0.0014	0.0866	0.2103	-0.0396	-0.1954*	-0.0389	-0.0452	0.1403*	-0.0715
		BVT(c)	-0.0796	-0.0299	0.0137	0.0287	-0.0231	-0.1363*	-0.1877*	0.0214	0.1035	-0.0246
		SAB(c)	-0.0750	-0.0491	-0.1273	-0.1199	0.0366	-0.1824	0.0191	0.2025*	0.3086*	-0.0658
		SOL(c)	0.0901 [^]	0.0234	-0.0578	-0.0113	-0.0368	-0.1533*	-0.0776	-0.0120	0.0872	0.0773
W		AGL(c)	0.1383*	0.2917*	0.1353*	0.1495*	0.2313*	0.1777*	0.2832*	0.2507*	0.0965*	0.3223*
		BVT(c)	0.2963*	0.4205*	0.2934*	0.2608*	0.3136*	0.2087*	0.2822*	0.2308*	0.1936*	0.2386*
		SAB(c)	0.4071*	0.2780*	0.1485*	0.3772*	0.3281*	-0.0171	0.2420*	0.0514	0.0620*	0.3539*
		SOL(c)	0.1048 [^]	0.3559*	0.2409*	0.2974*	0.2080*	0.3355*	0.3696*	0.2669*	0.2306*	0.2558*
X		AGL(c)	0.1030	-0.0752*	0.0555 [^]	0.0120	0.0254	-0.0643 [^]	-0.0448	0.0220	0.0724*	0.0025
		BVT(c)	0.0332	0.0203	-0.0267	0.0225	0.0100	-0.0402	0.0079	-0.0271	0.0198	-0.0985
		SAB(c)	0.0421	0.0602	0.0073	0.0205	-0.0731 [^]	-0.0558	-0.0070	0.0495	-0.0214	-0.0504
		SOL(c)	0.0295	0.0198	0.0837*	-0.0304	-0.1303*	-0.1060*	-0.0334	0.0523	0.1159*	0.0247
ASA(c)		AGL(c)	0.1266*	0.3246*	0.1414*	0.2516*	0.2046*	0.2204*	0.1787*	0.1405*	0.2593*	0.2843*
		ASA(c)	0.1627*	0.5241*	0.2924*	0.4009*	0.3764*	0.1541*	0.2098*	0.2031*	0.3697*	0.2848*
		SAB(c)	0.4001*	0.2415*	0.2204*	0.2672*	0.2478*	0.0840	0.1240*	0.1055*	0.2158*	0.3960*
		SOL(c)	0.1430*	0.2780*	0.1919*	0.3384*	0.3663*	0.2778*	0.2696*	0.3641*	0.2536*	0.2829*
ASA(c)		AGL(c)	0.0584	-0.0139	-0.0707	-0.0192	-0.0189	0.0052	-0.0188	-0.0048	-0.0294	0.0743
		ASA(c)	-0.0053	-0.0304	-0.0419	-0.0310	0.0459	0.0476	-0.0447	-0.0628	0.0219	0.0216

(continued)

Table 3 (continued)

<i>Mean Equation</i>																										
SAB	SAB(c)	-0.0178	0.0483	-0.0490	-0.0827	-0.1798*	-0.0075	0.0467	0.0956	-0.0836	-0.0439															
	SOL(c)	0.0453	-0.0014	-0.0178	-0.0734	0.0012	0.0380	-0.0244	0.0116	-0.0213	0.1120^															
	AGL(c)	0.1481*	0.2670*	0.2063*	0.2035*	0.1679*	0.1409*	0.1526*	0.1562*	0.1562*	0.1289*	0.2040*														
Y	ASA(c)	0.1347*	0.1605*	0.1163*	0.1622*	0.1245*	0.1419*	0.1842*	0.1163*	0.0866*	0.2393*															
	BVT(c)	0.1758*	0.1201*	0.2557*	0.0903*	0.1411*	0.1406*	0.1322*	0.0523*	0.1517*	0.1663*															
	SOL(c)	0.0211	0.1763*	0.1169*	0.2228*	0.1442*	0.1624*	0.3080*	0.1603*	0.1603*	0.1945*	0.1315*														
Z	AGL(c)	0.0033	0.0412	-0.0280	0.0377	-0.0368	0.0278	-0.0460	0.0283	0.0348	0.0519															
	ASA(c)	-0.0161	0.0084	0.0187	-0.0276	-0.0038	0.0019	-0.0352	-0.1198*	0.0270	-0.0264															
	BVT(c)	-0.0677^	-0.0047	0.1156*	0.0090	0.0480	0.0328	0.0274	0.0274	-0.1289*	-0.0354	0.0138														
SOL	SOL(c)	-0.0024	0.0147	-0.0109	0.0251	0.0284	0.0846*	-0.0304	-0.0106	0.0843*	-0.0108															
	AGL(c)	0.3943*	0.4848*	0.3943*	0.3598*	0.3524*	0.3290*	0.3307*	0.2146*	0.2758*	0.2558*															
	ASA(c)	0.0394*	0.5051*	0.4268*	0.3472*	0.2244*	0.3711*	0.3095*	0.3307*	0.2395*	0.3777*	0.2334*														
Z	BVT(c)	0.1383*	0.4101*	0.2877*	0.2561*	0.3304*	0.3087*	0.2811*	0.3201*	0.2251*	0.2207*															
	SAB(c)	0.0157	0.5680*	0.2994*	0.4565*	0.3188*	0.1256*	0.2315*	0.1976*	0.1935*	0.3855*															
	AGL(c)	0.0463	0.0700	-0.1254*	0.0501	0.0849*	0.0093	0.0724^	0.0095	-0.0186	-0.0781*															
Z	ASA(c)	-0.0765	0.1299*	-0.0125	-0.0470	0.1018^	-0.0806	0.0573	0.0118	-0.0852	-0.0747															
	BVT(c)	0.0389	-0.0983^	0.0315	0.0837^	0.0630	0.0707	0.0648	-0.0474	0.0239	-0.0650															
	SAB(c)	-0.1273^	0.1415	-0.1238	0.0796	0.1666*	-0.0411	0.1468*	0.0255	0.0216	-0.0117															

* Indicates statistical significance at the 95% level. ^ Indicates statistical significance at the 90% level

Table 4 AS model results (variance equation)

Variance Equation		Coefficient of the κ -terms									
Period	1	2	3	4	5	6	7	8	9	10	
AGL	ASA(e)	1.1893*	-0.1244*	0.0084	0.2349*	-0.6460*	-0.9410*	-0.2342*	-0.9530*	0.0442*	0.2314*
	BVT(c)	0.5482*	0.0208*	-0.9849*	0.0704*	0.7341*	0.1763*	0.1928*	1.3266*	-0.1518*	-0.2105*
	SAB(c)	0.8162*	0.1877*	0.3467	0.0482*	0.6448*	0.0391*	-0.0611*	-0.1168*	0.7810*	0.1006*
V	SOL(c)	0.5959*	0.5805*	0.3716*	0.0929*	0.3381*	-0.0833*	-0.1361*	0.0422	0.0486*	0.2183*
	ASA(c)	0.3016*	-0.1749*	0.0843 [^]	-0.2635*	0.1585	-0.2694	-0.0480*	-0.0927	-0.0175*	0.7989 [^]
	BVT(c)	-0.1258	0.0859	-0.0387	0.1482 [^]	-0.6733	0.0572	0.0833	0.0708*	0.2077	0.1869 [^]
ASA	SAB(c)	0.4079*	0.1109	0.5135 [^]	0.0565*	0.1933	0.0874	-0.6823*	0.0250	-0.6370*	0.3490 [^]
	SOL(c)	-0.2317*	-0.0217*	-0.7390	-0.5759*	0.2053*	0.0033	-0.2909*	-0.1415	-0.2878 [^]	0.1330 [^]
	AGL(c)	1.1893*	1.3919*	-0.0878	0.2158*	0.9368*	0.2712	0.3756 [^]	-0.9511*	-0.0697	1.1143*
W	BVT(c)	0.9149*	0.2427*	0.7222*	0.2060*	-0.0564*	-0.1386*	-1.0436*	-0.0448*	1.5953*	0.6512*
	SAB(c)	1.0437*	0.4719*	-0.1141*	0.1763*	0.5438*	-0.1418*	-0.0773	-0.0819*	0.0218*	0.7377*
	SOL(c)	-0.1912*	-0.0350	0.6460*	0.0171	0.6184*	0.0126	0.9236*	0.1049*	0.6185*	0.1387*
BVT	AGL(c)	0.7272 [^]	-0.4520*	-0.0072	-0.1011*	0.0984	-0.2935	-0.3832 [^]	-0.0335	0.0205	0.8870*
	BVT(c)	0.0391	-0.1151	0.0198	0.4495 [^]	0.1312*	-0.1225 [^]	-0.5014*	0.1033*	0.5401	-0.5261
	SAB(c)	-0.1053*	-0.3890*	0.1317*	0.0446	-0.3033 [^]	-0.0813	0.0790	0.0586	0.0376	0.6066 [^]
X	SOL(c)	0.0331	-0.4915 [^]	0.2450	0.4819	0.2827	-0.1193*	0.2977*	0.1157	-0.0874	-0.0940
	AGL(c)	0.7199*	-0.2367*	0.0513	-0.1257*	0.7033*	1.6474*	0.3029*	-0.8583*	0.4892	0.1114*
	ASA(c)	0.1881*	0.3087*	0.6560*	-0.1213*	0.1505	-1.0922*	0.1170 [^]	-0.8224*	0.0120*	0.3912*
ASA(c)	SAB(c)	0.0797*	0.1788*	0.0014	-0.7477*	-0.0451*	0.0857	0.7093*	-0.0512*	0.0235 [^]	0.2744*
	SOL(c)	0.2305*	0.3822*	0.5282*	-0.5467*	-0.1805*	0.2689*	-0.0124	0.2851*	0.1174*	0.2472*
	AGL(c)	-0.2328*	-0.1876	-0.0759	0.1461	-0.3058 [^]	-0.2615*	-0.1240*	0.0523*	0.0119	0.3946*
ASA(c)	-0.0648	0.1030	-0.1921*	-0.2419	-0.5545*	-0.3734	-1.0029 [^]	0.0333	0.0059	-0.5502*	

(continued)

The focus of this study was however to determine the impact on portfolio risk as measured by the κ_i -coefficients. Table 4 reports on the actual volatility spillover effects of a given stock from all the other stocks in the portfolio. As before, the bulk of the statistically significant volatility transmission effects were reported between the original stocks included in the portfolio. Once a proxy stock is introduced, the volatility spillover effects are diminished. Although some stocks were transmitting more volatility to a proxy stock than to its original, the overall combined volatility spillover effects are less for the proxy stocks than for the originals. The researchers did note that volatility spillover effects increased during the most volatile periods of the 2008 financial crisis (periods two to four), after which volatility spillover effects decreased again. This finding is in keeping with Longin and Solnik (1995), Kaminsky and Reinhart (1998), and Maniya and Magnusson (2010) that found higher integration between stocks during periods of financial turmoil.

This is corroborated by the volatility persistence measure. Most volatility persistence coefficients are significant for both the original and proxy stocks and these coefficients were smaller than one besides two out of the 400 estimated AS models, indicating that fluctuations in returns will be present for a protracted time after the initial volatility spike. It is therefore clear that the proxy stocks attract significantly less volatility spillover effects from the other stocks, and that this correlates with lower portfolio volatility while maintaining the same returns.

5 CONCLUSION

Given that investment funds are mandated to constantly rebalance their positions, and that this process becomes more complex during times of financial distress, getting adequate information becomes more important. This study provides an additional risk measure that enables the construction of a more efficient portfolio in the form of a residual-based test (AS model) that incorporates volatility spillover effects between stocks. When a stock attracts fewer spillover effects from the other stocks in the portfolio, the overall portfolio volatility decrease. To construct a more efficient portfolio, therefore, requires stocks with the least amount of volatility spillover effects among one another in addition to having a unit correlation with the market.

6 PRACTICAL EXPERIENCE/ISSUES

These findings have only used the AS model as the preferred method of residual-based testing. This study was just a proof of concept, and to ensure the adoption of the lessons learnt here in practice, other residual-based tests must be used to corroborate the findings. Other possible testable frameworks include among others the multivariate E-GARCH (Karolyi, 1995), GARCH-BEKK (Maniya & Magnusson, 2010), or the Dynamic Conditional Correlation (DCC) model (Engle, 2002). To test these models, the researcher can use a volatility spillover index as used by Diebold and Yilmaz (2009). The index could be expanded to include all stocks listed on an exchange and should include constant updates on volatility spillovers to a specific stock from a selection of stocks in the investable stock universe. Although it will be a computationally expensive exercise, it will significantly improve the stock selection process for portfolio managers.

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The Relationship Between the Forward and the Realized Spot Exchange Rate in South Africa

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1 INTRODUCTION

This chapter will cover the research process while investigating the exchange rate puzzle. The exchange rate puzzle refers to the observed phenomenon of the forward exchange rate—based on forward

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interest points—that differs substantially from the spot exchange rate realized in the future. This phenomenon is not only debated in the academic sphere but is reported in practice as well.

Tackling the research from an academic viewpoint only would not be ideal. Research has no value if it is performed for its own sake only, and if the lessons learned here cannot be extrapolated into the real world, its impact is reduced significantly. The researchers were therefore careful to ensure that a thorough research process was followed and that recommendations to market stakeholders were communicated at the end of the study. To this end, the research process was informed by the framework first put forward by Saunders et al. in 2019 in the form of their research onion. This rigorous process ensures that the research is anchored in a solid foundation and follows a logical approach to take the researcher from conception to conclusion.

Although the research process can be started from anywhere in the onion, this study focused on the data first, moving through the layers of the onion from the inside out. The reason for starting with the data is because it is here that the contribution of the study lies. It is more prudent from a practical standpoint to look at the research onion from the outside inwards. When looking at research from a philosophical perspective first, the other layers of the onion flow logically from it. The research philosophy can, therefore, be seen to direct the study at the hand of a detailed worldview. This view of reality will guide the research along specific lines, giving meaning to all results and conclusions that flow from the study.

After defining the research philosophy, the next step is to decide which research approach will be followed as it dictates how results will be interpreted. As such, the system can be inductive, deductive, or abductive. Once the research philosophy and approach are in place, the researcher should decide on the methods and strategies to be followed to solve the research problem. Translating the research problem is the crux of all research endeavours, and without a good research problem, there is no justifiable reason for spending any resources on the research effort.

To solve the research problem, it is essential to accurately define the research question, as this would guide the researcher in solving the problem if properly answered. The methods and strategies to be followed naturally flow from the research question and guides the researcher to set objectives for the study. These research objectives can be met by following several research strategies, which to a large extent, are determined by the research philosophy and the format that the data takes. The final layer

of the onion is to define time horizons, followed by data collection and analysis.

Given the research framework discussed above, the researchers started with the innermost layer of the onion—the data. The data used in this study is in the form of time series data (longitudinal). It is central in solving the riddle of the observed difference between the forward exchange rate and the realized future exchange rate. This is called the exchange rate puzzle because the forward exchange rate should be a very accurate predictor of the realized future spot exchange rate. To gauge what the exchange rate will do in the future, investors use the daily quoted forward points in the foreign exchange (FX) market to decide whether they want to hedge their exposure to the exchange rate. Because it is impossible to know what will happen to the exchange rate in the future, these forward exchange rates are then used in present transactions and decision-making processes. Surprisingly, the forward exchange rate is determined mechanistically in that it is calculated by adding the forward points to the current spot rate. This is seemingly not widely known, especially by academics.

Calculating the forward points (used to calculate the forward exchange rate) is straightforward. It simply adds or subtracts a premium or discount from the current spot exchange rate. The premium or discount is calculated by taking the difference between the interest rates of the two currencies involved over an amount of time (generally between three months to a year). The forward exchange rate can, therefore, be calculated as

$$Forwardrate = spotrate \times \frac{1 + \left(\frac{i_{qc} \times days}{basis_{qc}} \right)}{1 + \left(\frac{i_{qbc} \times days}{basis_{bc}} \right)},$$

where i_{qc} is the interest rate in the country where the currency is quoted, and i_{qbc} is the interest rate in the country of the base currency. In the case of the United States dollar (USD) and the South African rand (ZAR), the short-run nominal South African interest rate is used, which is then multiplied by 365 (days) and divided by 365 (South African annual basis). In the denominator, the short-run nominal interest rate of the United States is used which is then multiplied by 365 (days) and divided by 360 (U.S.A. annual basis). The forward rate equation

above assumes that the short-run Fisher effect holds for both developed countries (U.S.A.) as well as for developing countries (South Africa).

Because the forward exchange rate is not a good predictor of realized future exchange rates, a number of studies attempted to find where the discord lies. Ott and Veugelers (1986), for example, concluded that the forward exchange rate is also influenced by changing inflation rate differentials, interest rate differentials and the monetary policy in the two countries, while Korajczyk (1985) found that real interest rates can explain the foreign exchange rate premium. Other contributions to the debate include Huang (1990), who finds that the purchasing power parity (PPP) approach may yield better results than interest rate differentials. Morley and Pentecost (1998) and Chiang (1991) added to the literature by highlighting the importance of expected equity premiums, and Jiang and Chiang (2000) found a link between currency markets and stock market volatility. Despite these and numerous related studies, changes in exchange rates remain primarily random and unpredictable.

Given the nature of the problem as described above, the researchers were led to consider the nature of the data before deciding on the methodology to be employed. Since the data is longitudinal, and the previous endeavours to solve the exchange rate puzzle used several economic time series data sets, the researchers adopted a quantitative methodology. This is typical when using data collected from secondary sources in the form of time series.

2 RESEARCH PROBLEM AND RESEARCH QUESTION

Market participants make use of the forward exchange rate as an indicator of market expectations when estimating the potential values of expected future exchange rates. This proves unsuccessful as floating exchange rates are essentially random and unpredictable, and the realized spot exchange rate differs significantly from the forward exchange rate. This makes it very difficult for market participants to price a variety of assets on the market correctly.

The primary research question that naturally flows from the problem is whether the realized future spot exchange rate (time $t + i$) can be better explained by current (time t) economic fundamentals, thus moving away from the mechanistic determination of the forward exchange rate currently in use? This modelled exchange rate will have to be closer to the realized future exchange rate if it is to be adopted as a methodology

by market participants. Should the first question be answered in the affirmative, a secondary research question can be asked; is the exchange rate puzzle a pseudo puzzle resulting from the rigorous, unyielding practice of using only stationary time series data in the investigations into this ‘puzzle’?

The appropriate research design is critical to answer these questions as it places the results and findings into context. With the wrong design, there is a risk that the researchers’ view of reality might influence the findings’ outcome and distort the outcome. Section 3 will expand on the research design.

3 RESEARCH DESIGN

The research design informs the process to be followed in answering the research questions and thereby solving the research problem. The framework used to structure the research is that explored in Saunders et al.’s. (2019) research onion. The research onion takes the researcher through the research process in a systematic way and ensures that proper thought is given to each aspect of the research process. Although the researchers used the data as the starting point for this research, the discussion below will address the process as it is done traditionally. This section will, therefore, address the layers of the framework from a general viewpoint to a specific one. The research paradigm will be discussed in Sect. 3.1, followed by the research approach in Sect. 3.2. After that the choice of methodology is discussed in Sect. 3.3, the research strategy in Sect. 3.4, while the decision of time horizons is covered in Sect. 3.5. Finally, the techniques followed will be discussed in Sect. 3.6.

3.1 *Research Philosophy*

The research paradigm or philosophy is the overarching architecture that is used in the development of knowledge and the nature of that knowledge. The research philosophy, therefore, holds important assumptions about how we view the world, and it supports the research strategy and the methods chosen as part of that strategy (Saunders et al., 2019). We can think of the research philosophy in three ways; ontology, epistemology and axiology.

Ontology defines the nature of reality as the researchers view it and raise questions about the researchers’ assumptions about how the world

works. Epistemology, on the other hand, defines the nature of knowledge itself, while axiology defines the research's values, beliefs and ethics. It is therefore clear that before the research could commence with the appropriate research philosophy, the ontology, epistemology and axiology of the research had to be considered first.

Starting with the ontology of the research, the nature of reality according to the researchers in this study is that the truth can be discovered objectively. Since the objective of the study is to discover the optimal fit between realized future exchange rates and the current forward exchange rate, the researchers will make use of historical time series data in the form of various economic variables. Because the data collected in time series format reflect buy and sell prices for currencies, stock prices, inflation rates and interest rates, the data as well as its statistical properties reflect a single economic reality. All conclusions that are formed from the results should, therefore, be interpreted objectively.

Next, when considering the epistemological aspect of the study, the researchers assumed that knowledge can be measured. This assumption is born from the data. Since the data is collected either in the form of prices or rates of change it is immutable before the researchers can collect it. This implies that all enquiries into the statistical properties of the data is measurable and that the data and its statistical properties will be the sole factor to be considered when conclusions are drawn from the results. Because measurability indicates that the research approach is objective, the epistemology points to that of the positivist view of reality.

Finally, when addressing the axiological aspect of the study, we consider the judgements about value. The consideration of one's value system is off course necessary as it plays a role in all the subsequent stages of the research process and impacts greatly on the credibility of the research results. Clearly, the choice of research philosophy, therefore, reflects the values of the researchers and as a result the choice of data collection and research techniques (Saunders et al., 2019). Since the researchers in this study made use of secondary data collected from data aggregators (the Johannesburg Stock Exchange (JSE), Statistics South Africa and the Reserve Bank), there were no ethical issues to be considered.

Therefore, considering the ontology, epistemology and axiology of the research it is clear that this research was approached from a positivist philosophical standpoint. The researchers took the view that knowledge exists in its own right and is not influenced by the subject being researched. We can, therefore, conclude that the topic was considered

objectively. In the case of the exchange rate puzzle, the opinions or personal viewpoints of the researchers are not relevant and there is no need for any subjective interpretation of the results. All knowledge is considered to be posteriori knowledge, and as a result the findings and conclusions drawn from the results are based in observation only.

3.2 *Research Approach*

The research approach forms part of the second layer of Saunders et al.'s (2019) research onion. During this part of the research process, the researcher decides whether to follow an inductive, deductive or abductive approach to the research. During inductive reasoning, the researcher aims to extract probable evidence from specific but limited observations, ergo conclusions are drawn from the data. This allows for broad generalizations to be made from specific observations. When reasoning deductively, the researcher starts out with a general hypothesis, and then examines the possibilities to reach a specific, logical conclusion. This means that the researcher starts with a hypothesis that is then tested against logical reasoning. Finally, abductive reasoning entails drawing the most likely conclusion from the observed facts. Naturally, the researcher must weigh various causes as the one or one combination of causes that results in the outcome observed.

Given the nature of the research performed here, a deductive approach was considered the optimal approach. The deductive process seeks to explain causal links between variables (Saunders et al., 2019). To do that, the researcher must gather quantitative data and remain independent of what is being observed from the data. Once the data is gathered, the appropriate methodology should be employed such that facts can be measured quantitatively according to the principle of reductionism. This is important as problems can be better understood if they are reduced to their simplest elements. Finally, results can be generalized to answer the research question posted.

Tackling the problem of the exchange rate puzzle, therefore, led the researchers to develop a theory and hypotheses to solve the problem. Following the setting of these hypotheses, a research strategy was designed to test these hypotheses. The first hypothesis was that current (time t) economic variables could be used to explain the realized future spot exchange rate better than the mechanistic approach followed by market participants. The second hypothesis was that the exchange rate

puzzle is a pseudo problem which is the result of the rigorous, unyielding practice of exclusively using stationary time series during the investigations into this problem.

Given the discussion above this investigation flows naturally from the positivist philosophy that knowledge exists outside the subject being researched here. The following layer of the research onion is the choice of methodology.

3.3 *Choice of Methodology*

Bryman (1984) state that the methodology of a study refers to an epistemological position that indicates different levels of analysis. Since the data for this study was collected in the form of prices and growth rates from data aggregators it is unchallengeable, and the researchers cannot influence the results by changing the data in any way. The epistemology of the research, therefore, points to an objective approach in that all enquiries into the statistical properties of the data are measurable and that there is no room for opinion. Given this epistemological stance the choice of methodology should align with the research approach as well as the overarching philosophy of the study. The researchers also must keep the problem in mind and how it is to be solved guaranteeing academic integrity.

The problem to be solved is that the realized future exchange rate does not reflect the current forward exchange rate. To effectively address this problem, the researchers posed the following null hypothesis: that it is possible to improve on the current methodology of determining the realized future exchange rate by modelling it as a function of current economic fundamentals without insisting on using exclusively stationary data. A rejection of this hypothesis would imply that current practices by researchers in the field of finance and economics are correct to either use the popular mechanistic approach discussed above, or to only use data in their stationary form. It should, however, be pointed out that neither of these current practices are preferable as both these approaches still leads to the inaccurate prediction of the realized future exchange rate.

Given the nature of the problem, the overarching philosophy and the research approach, a quantitative research method was deemed the appropriate method. According to Queirós et al. (2017), the focus of quantitative research is on objectivity. The authors emphasize that the quantitative approach is especially appropriate when variables can be

quantified, and inferences can be made from samples of a population. Given that the economic variables used in this study can be quantified this research methodology is ideal for testing the hypothesis set out above.

3.4 Research Strategy

When considering the correct research strategy to be followed, the researcher can choose amongst a number of possibilities. These include archival research, action research, running experiments, running case studies, running surveys, running a narrative inquiry and grounded theory (Saunders et al., 2019). As the research strategy is strongly influenced by the nature of the problem to be solved, and by extension the type of data to be used, this study took an experimental approach.

3.5 Decision of Time Horizons

Saunders et al. (2019) identify two choices the researcher has when deciding on the time horizon for the data. The first option is to make use of cross-sectional data which is when information relating to different data points are being investigated at a specific point in time to highlight differences between the data points. The second option is to make use of time series data which covers variables over successive time frames (Bryman et al., 2019).

Since the problem in this study is the accurate forecast of the realized spot exchange rate, it is natural that the researchers had to make use of time series data in this instance. All of the economic variables used in this study, including the exchange rate itself, are in time series format, leaving little room for making use of a cross-section approach.

3.6 Research Techniques

Because the result of any study is a function of the techniques followed in the process of conducting the research, it is important that the correct techniques are used. To ensure that a sound process is followed, a number of steps should be followed. The first step is to determine what data should be collected, and then how the data is to be collected. Deciding on the data to be collected is not to be left to intuition, but by rigorous investigation of current and historical literature. The second step is to determine the method of data collection. This is important because it can

influence the final result in that the nature of the data might be influenced by the collection process.

The third step is to decide on the models or techniques that will be used for analysis. Again, the selection of the model is critical. Using one model over another might significantly alter the result. Finally, the researcher will have to decide on the process to be followed when modelling the data. These steps are discussed in more detail below.

Data Collection

The researchers made use of time series data to model the exchange rate puzzle. To do this, it was necessary to model the realized future exchange rate as a function of the current forward exchange rate. This was done with secondary data in the form of stock prices for a number of dual-listed stocks, the current spot ZAR/USD exchange rate, the 3-month forward points, treasury bill rates, 10-year government bond yield rates for South Africa and the U.S.A. as well as producer price index (PPI) and consumer price index (CPI) values for both countries. The sample period stretches from May 2002 to February 2009. The period is somewhat longer than sample sizes used in similar studies. This was decided on for two reasons. The first was an attempt to improve the accurate estimation of inflation rate expectations and the second reason was to ensure better mean reversion estimates (Balvers et al., 2000).

Naturally, all the data had to be tested and its properties be noted. Thereafter, the necessary data transformations had to be performed to ensure that the results could be trusted once attained. Following the reductionist approach mentioned above, the researchers tested for the impact these variables had on the value of the realized future exchange rate, ensuring that only statistically significant variables were included in the final model.

Model Choice

Once it was clear which data were to be used for the final modelling process, the appropriate models had to be chosen to model the realized future exchange rate. This is an important part of the research process, as choosing an inappropriate model will render inaccurate and sub-par results. The current models being used to model exchange rates prove this to be true. These include, but is not limited to, the Mundell-Fleming model, the sticky price monetary model, the flexible-price monetary

model, the portfolio-balance model, and a variety of new open-economy macroeconomic models.

For a model to correctly predict the realized future exchange rate several characteristics should be included in the model. The first characteristic that such a model should possess is a way to incorporate market expectations. This can be done by incorporating the price differences of dual-listed stocks into the model. The second characteristic of a successful model is the inclusion of all the explanatory variables required for estimating the current spot exchange rate. To this end, three variables are introduced into the model developed here. These three variables are the inflation rate differential (drawn from the purchasing power parity theory), the interest rate differential (drawn from the Fisher effect) and the forward exchange rate (drawn from the interest rate parity theory). The final characteristic of a successful model is the inclusion of an appropriate explanatory variable that can capture the interaction of financial markets (volatility spillovers) that can be incorporated into an exchange rate model.

In addition to these characteristics, the final model also introduces an alternative method of generating inflation and stock return expectations by using an exponential weighting procedure and an equally weighted moving average (EWMA) model. The inclusion of the EWMA model allows for the incorporation of both historical expectations and future (uncertainty) expectations into a 1-month ahead, presently expected inflation rate/stock return series.

Modelling Process

Before modelling can start, the data must be analysed in their raw form by means of descriptive statistics to summarize their properties in a meaningful way. The next step is usually to test each time series for the presence of a unit root as this would indicate that the data is not stationary. The traditional econometric approach of modelling exchange rate models assumes that the underlying time series are already stationary. Stationarity implies that the mean and variance of a dataset are constant over time. This implies that the value of the covariance between two time periods only depended on the distance between the two time periods and not on the actual time at which the covariance was computed (Gujarati, 2003). When using non-stationary variables, the researcher runs the risk that there might be serial correlation amongst explanatory variables. In such cases, it is common to observe spurious results that can be identified

as results with high R-square values, a low Durbin Watson statistic and highly statistically significant coefficients (Gujarati, 2003). These results may imply that the model may have been mis-specified, that irrelevant variables were used, or that autocorrelation is present in the residuals (Granger & Newbold, 1974).

Because the very same characteristics are also present in accurate results, researchers are often reluctant to take any chances with the use of non-stationary data. To prevent spurious results, logged or first differences are often taken of the variables that are included in the model. Log or first differencing all variables that contain unit roots do however cause its own problems in that information within the time series can be lost. Also, unit root processes have limitations when modelling economic theories because a unit root model can be rejected in favour of a trend alternative, which is by definition an alternative representation of the unit process itself (Phillips, 1998). This implies that neither unit root models nor deterministic trends can model economic theory adequately.

There are however alternative processes that can be used to prevent these problems. Since the use of stationary data leads to the exchange rate puzzle, this study made use of economic variables that were log or first differenced to achieve stationarity in the first round of investigations and level data in the second round. To prevent spurious results when using non-stationary, level current economic time series data, the data was incorporated into a standard OLS model in its untransformed format to acquire preliminary results.

Thereafter a Breusch-Godfrey serial correlation LM test was used to determine the presence of serial correlation amongst the explanatory variables. Where serial correlation was found, an ARCH/GARCH model was applied to deal with the serial correlation in the variables. Because these models may still allow for the existence of serial correlation, the Breusch-Godfrey serial correlation LM test is run again to ensure that all serial correlation was eliminated. Once the Breusch-Godfrey serial correlation LM test confirms that all serial correlation was removed from the variables, the ARCH/GARCH model's residuals were tested for the presence of unit roots. If no unit roots are present it serves as confirmation that the results are not spurious.

Finally, the results from the ARCH/GARCH model were benchmarked with a Johansen (1991) co-integration model, in order to confirm the statistical significance of the exchange rate model's explanatory ability.

In the case, where the theoretical forward exchange rate proves to be co-integrated with the realized future spot exchange rate, it would serve as proof that current economic fundamentals can be used to forecast the realized future spot exchange rate.

4 RESEARCH EVIDENCE

After running the appropriate models, the interpretation of the results was performed deductively. This method of interpretation necessitates that the researchers aim to look objectively at the results and the statistical properties of the data. The research process developed here focused on the underlying statistical properties of the data.

The first aspect of the data that had to be determined was whether the ZAR/USD exchange rate exhibits long memory. This was proved in the affirmative, implying that economic fundamentals could indeed be used to estimate the realized future spot exchange rate. However, before moving on to the determination of suitable economic fundamentals, the presence of an exchange rate puzzle in the ZAR/USD exchange rate had to be affirmed. Should the forward ZAR/USD exchange rate differ significantly from the realized spot exchange rate it would suggest that the forward exchange rate is a biased estimate of the realized future spot exchange rate.

Since this was indeed so there is a case for the use of additional economic fundamentals to improve the accuracy of a model that would forecast the realized future spot exchange rate. As such, the following economic fundamentals were identified: the International Equity Parity theory, the PPP theory, the Uncovered Interest Rate Parity theory, the Covered Interest Rate Parity theory and the expectations hypothesis of the domestic term structure of interest rates.

The initial model used to model the economic fundamentals for their suitability was a model based on the Chiang and Yang (2007) methodology. The results from this model suggested that stationary time series data was not suitable for modelling exchange rate theories, indicating that economic fundamentals are unable to explain the realized future spot exchange rate completely. The results also indicate that the use of composite variables, as suggested by the Chiang and Yang (2007) methodology, will only lead to statistically insignificant results.

Therefore, this study concentrated on the use of the individual economic fundamentals instead of the composited variables. The results

from the Uncovered Interest Rate Parity theory, the Covered Interest Rate Parity theory, the PPP theory and the Fisher effect show that actual inflation rates (not expected inflation rates) and the short-run interest rates (not long-run interest rates) yield the most accurate forecast. It was further found that the Sappi Limited stock return differential, the AngloGold Ashanti speed of adjustment series and the Sappi Limited ICAPM were the best proxies to use when incorporating the interaction between the JSE and the New York Stock Exchange in an exchange rate model because these proxies rendered the best results. This incorporation led to a 43% increase in the R-squared value compared to the use of the Chiang and Yang (2007) model. However, regardless of this improvement, including economic fundamentals still fails in explaining the realized future spot exchange rate completely.

To improve the accuracy of the explanation of the realized future spot exchange rate and of the exchange rate puzzle, a second approach was taken. This approach made use of individual economic fundamentals data in level format. Making use of the data in this format increased the explanation of the realized future spot exchange rate significantly (81%). Because the data were not transformed to make it stationary, a Johansen (1991) co-integration model was used to confirm the absence of spurious results. The co-integration model indicated that the results were not spurious, verifying the increase in explanatory power of the realized spot exchange rate, compared to the Chiang and Yang (2007) results. This proves that economic fundamentals can be used to generate a theoretical forward exchange rate that can substitute the current mechanistic calculated forward exchange rate.

Taking the result achieved when making use of individual economic fundamentals data in level format, both hypotheses were addressed. The first hypothesis is proven to be true in that current (time t) economic variables can clearly be used to explain the realized future spot exchange rate. The second hypothesis was also proven true in that the exchange rate puzzle is a pseudo problem that stems from the rigorous, unyielding practice of exclusively using stationary time series during the investigations into this problem.

5 CONCLUSION

The current practice of arriving at a forward exchange rate by means of a mechanistic estimation, based on the current spot exchange rate and the

carry cost of the transaction, is flawed. The results demonstrate that the forward exchange rate calculated in this manner differs substantially from the realized future spot exchange rate, giving rise to the exchange rate puzzle.

As such, this study found that the exchange rate puzzle is a pseudo problem. The root of this problem lies in the generally excepted fallacy that current, non-stationary, time series data cannot be used to model exchange rate theories, which in turn is based on the incorrect assumption that all available econometric methods yield statistically insignificant results due to spurious regressions. In many cases, researchers do not venture far enough outside the proven constraints of the field and as a consequence do not search hard enough for ways around that which is so easily set in stone by seminal papers. By using non-stationary, level time series data of current economic fundamentals, and verifying the results by means other than the vanilla battery of tests, the realized future spot exchange rate were proven to be modelled successfully using data in their level format without suffering the spurious results problem.

6 PRACTICAL EXPERIENCE/ISSUES

Even though the research process can follow a logical path, Saunders et al. (2019) state that this is rarely true, and that many ideas seem great at the start, only to be dismissed later in the process as more information is revealed to the researcher. It was no different for this study. There were a few obstacles which the researchers had to overcome over the course of the research. The most important obstacle was the use of data in level format. This is frowned upon in academic circles because of the spurious results problem. A lot of care, therefore, had to go into explaining why the data was not transformed into stationary data series for use in the final model.

The researchers were also taken down several paths of investigation during the research process. Which data or results to include and which to report is always a difficult decision that often delays the research process. Again, this study proved no different. After including and excluding several ideas from the final document, a number of these ideas were reported as recommendations that may provide more insight regarding exchange rate modelling, and that might be useful for future studies.

The first of these suggestions is that the use of daily data may yield better results. This suggestion does however have drawbacks of its own—hence its exclusion from this study. Inflation data is mostly reported in a monthly format, and the transformation of monthly data into shorter timeframes are less accurate than one would want.

The second suggestion is to investigate the use of a more appropriate proxy for determining whether the exchange rate is undervalued or overvalued. The researchers decided on the use of the Nominal Effective Exchange Rate as a possible benchmark to gauge when the ZAR/USD exchange rate was undervalued or overvalued. It is however true that each market participant has a different perspective on undervaluation and overvaluation, and a different proxy might lead to a different interpretation of the valuation.

Finally, the researchers also decided to exclude a battery of tests that aims at reporting on the forecasting ability of this study's exchange rate model. This seemed a natural next step in the field, but one too far for the scope of this research study. If anything, it is sometimes also important to know when the study reached its goals, proven its hypotheses and added to the body of knowledge without losing the interest of the reader.

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Policy Implementation of Credit Management at Selected South African Universities of Technology

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and Sanlie Middelberg^{id}

1 INTRODUCTION

Credit is a medium where the buyers receive goods, services, or even money immediately with a promise to pay in the future (Olegario, 2006). Adams (2006) argues that it is transformed into a commodity when university education is paid for. However, the problem arises that credit

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offered by universities to students differs from that of a regular business. Financial sustainability complications occur at universities when students are allowed to register without consideration of their creditworthiness or the setting of credit limits.

The study's design was built on the fundamental rationale guided by the underlying sociological paradigms of radical structuralism and humanism. Keeping these sociological paradigms in mind, a post-positivistic paradigm was selected for the study. This flexible research perspective allows multiple methods to investigate a research question. Furthermore, it promotes triangulation of qualitative and quantitative methods to explore a diversity of facts (Panhwar et al., 2017). The portfolio theory of accounts receivables provided criteria to investigate universities' credit policies in this study. The institutional and deprivation theories contextualized student debt and students' personal financial management, respectively.

The post-positivistic paradigm embraces the following of a mixed methods approach, allowing concurrent qualitative and quantitative investigations through inductive and deductive reasoning. Triangulation was then employed to combine the results of these two data sources. An archival (qualitative) research document analysis was performed using five selected South African Universities of Technology student credit management policies and annual audited financial statements. The quantitative data were collected using a questionnaire completed by 1382 senior students from these institutions. Data including participants' demographical information and their perceptions around (i) their universities' credit management, (ii) student debt, and (iii) personal financial management were collected. The cross-sectional data were analyzed as follows: content analysis was utilized to investigate the qualitative data, while statistical analysis was performed using the quantitative data.

The evidence in this study included the following:

- For the qualitative investigation, a thematic analysis revealed five themes pertinent to policy implications of credit management on student accounts; and
- The quantitative study identified nine factors that embrace the students' perceptions of (i) their debt, (ii) their universities' credit management policies, and (iii) their personal financial management.

This study concluded that the policy implementation of student accounts on credit management policy at selected South African Universities of Technology is associated with the nine factors extracted from the quantitative study.

2 BACKGROUND OF THE STUDY

In South Africa, similar to many other developing countries, the government dominates the funding of universities. However, individual universities' degree of dependence on state funds differs (Ouma & Cloete, 2008). Although each university is mainly independent in setting its policies, including *credit policy*, the collection of student debt and the overall financial performance fall with the Department of Higher Education and Training (DHET). The latter has a statutory responsibility to provide the funding and grants to support all students' academic programs in these universities (CHE, 2010). Nevertheless, student debt recovery remains a challenge despite the call by the DHET that all poor and needy students should be allowed to apply for special funding to clear their university debts (University World News, 2011). The challenges of university funding inevitably characterize the student debt at South African universities.

Cloete (2016) lamented that since late 2015, the South African government has been under pressure to react to a student movement (#FeesMustFall) demanding free university education. Calitz and Fourie (2016) ascribe the hike in university education fees over the last two decades to a decline in government funding, representing the largest university revenue source. This increase in fees led to what is known as the #FeesMustFall demonstrations of 2015 and 2016. These demonstrations changed the South African educational landscape—those students whose family income is below a certain threshold receive free education (Muller, 2018). However, this governmental action has led to a new “missing middle” group. According to Dano (2015), they are students who do not qualify for the National Student Financial Aid Scheme (NSFAS) funding or bank loans because they are at the end of the lower middle class.

In terms of financial stability, students are perceived as a high-risk group (Cude et al., 2006). The literature indicates that the risk for universities for granting credit is locked-up in three broad parts: (i) the

appropriateness of the credit policy (Michalski, 2007), (ii) students' attitude toward paying their debt (Chudry et al., 2011), and (iii) students' personal financial management skills (Nanziri & Leibbrandt, 2016).

- Firstly, the management of student accounts demands an appropriate student credit management policy, which includes applicable methods of ensuring prompt collections and decreasing bad debts (Kontuš, 2013). Credit management policies include many different practices, namely determining whom credit will be granted to, the allowed payment period, the collections of debt, evaluating the liquidity of receivables accelerating, and the cash handling from accounts receivables holders (Ngugi, 2015). Practices within the policies can vary between aggressive and conservative. For example, a conservative policy will allow easy credit granting, long payback periods, and lenient collections practices, while an aggressive (stringent) policy practices the opposite. Universities' credit policies need reform to make them appropriate to maximize value (Michalski, 2007). That implies universities should adapt their credit policies to be relevant and appropriate for their student community.
- Secondly, many studies focus on students' attitudes toward credit/student debt. To illustrate some typical studies, Baldwin et al. (1995) examine how the idea of debt to finance tertiary education is perceived by students; Callender and Jackson (2005) explore the relationship between prospective higher education students' attitudes to debt and their decisions about whether or not to enter higher education. Finally, Chudry et al. (2011) found that student accounts receivable have been reported to be a strongly negative factor in students' experience.
- Thirdly, numerous studies investigated students' personal financial management and found that socio-economical, demographical, or biographical differences relate to personal financial management skill levels (Bates et al., 2015; Nanziri & Leibbrandt, 2016). These skill levels influence their ability to manage student debt. For example, Kidwell and Turrisi (2004) found that student debt levels are negatively associated with students who perceived themselves as competent in budgeting. They concluded that personal management tendencies could consequently influence the accrual of financial debt.

The focus of this study was student credit management at selected South African universities. A distinction should be drawn between a university's predetermined published credit management policy and its effectiveness by *inter alia* measuring the actual credit management through financial statement analysis. From the discussion, it is evident that the effectiveness of the credit policy may be influenced by student perception of the credit policy, student attitude toward debt, and personal financial skills.

3 RESEARCH PROBLEM AND OBJECTIVES

The foundation of providing credit is based on trust as the buyers receive the goods or services immediately with a promise to pay in the future. As mentioned before, the process followed by universities of offering credit to students for tuition fees differs from regular businesses as students register without any assessment of creditworthiness or setting of credit limits. However, universities stipulate credit terms, often withhold students' academic results, and are not permitted to enroll if accounts are not paid promptly according to the set credit terms.

We argue that universities' credit management financial performance—mainly the effective recovery of student debt—is a product of their respective credit management policies. We further argue that the perceptions and attitudes of students paying their debt will assist in gaining a holistic view of credit management at universities. Therefore, this study investigated students' perceptions of their universities' credit management policy, student debt, and personal financial management. To balance these interrelated variables (indicated in Fig. 1), South African universities require guidelines to enhance the management of student debt and student credit management.

The research question posed is: What is the role of credit policy implementation and students' perception of credit management at selected South African universities to improve credit management effectiveness (performance)?

The main objective of this chapter is to demonstrate the research process that was followed to address the above research question.

The secondary objectives of the study are to:

- demonstrate the design of the study to generate evidence to answer the research question;

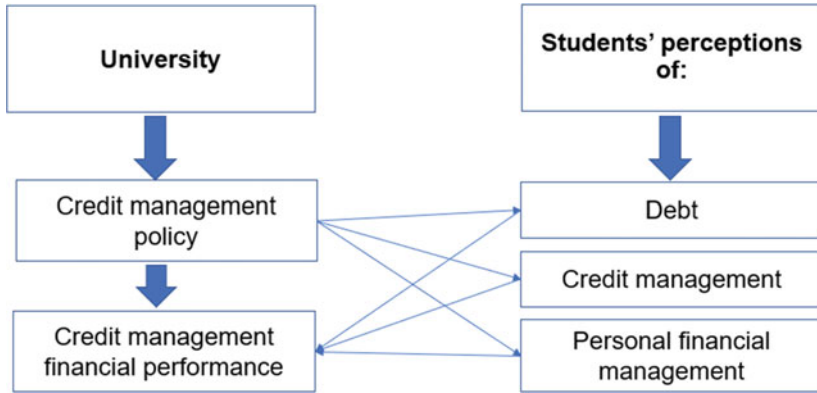


Fig. 1 Interrelation between factors influencing credit management performance

- reveal the evidence gathered with an archival investigation which *qualitatively* applied document analysis to form the basis to compare the (i) published credit policies and (ii) annual financial statement analysis of the selected South African universities;
- reveal the evidence gathered by the questionnaire that was quantitatively applied to test students' perception of (i) their debt, (ii) their universities' credit management policies, and (iii) their personal financial management; and
- indicate how these two sources' evidence was combined through triangulation to conclude on the credit management at the universities.

The findings of this study will benefit South African universities in terms of implementing credit management policies for student accounts by identifying the optimum credit management strategy. Furthermore, South African universities will efficiently manage their student debt recovery. Consequently, an effective credit management policy will improve South African universities' liquidity and financial sustainability.

4 RESEARCH DESIGN

The first secondary objective is to demonstrate the study's design. This is discussed in four sections, starting with the underlying sociological paradigms of radical structuralism and humanism (Sect. 4.1). This is followed by Sect. 4.2, which explains the study's reasoning, namely inductive and deductive, and how triangulation was applied to interpret the results. The mixed method of the study is discussed in Sect. 4.3, and the data, data collection, and analysis thereof are explained in Sect. 4.4.

4.1 *Underlying Sociological Paradigms*

The research paradigm is the starting point of the study's design since this explains how the researchers view the world. The fundamental rationale of this study was guided by underlying sociological paradigms of radical structuralism and humanism. The role of paradigms as views of social reality was explored in detail by Burrell and Morgan (1979). They argued that *social theory* in general, and *organizational theory* in particular, could be analyzed in terms of four broad world views, namely the (i) nature of science, (ii) subjective-objective dimension, (iii) nature of society, and (iv) dimension of regulation-radical change.

The prominence of structuralism and humanism is evident in the research question: "What is the role of credit policy (structuralism/humanism) implementation and students' (structuralism) perception (humanism) on credit management at selected South African universities (structuralism) to improve the effectiveness of credit management?" A post-positivistic approach was followed to investigate the research question.

As indicated in Fig. 1, the financial performance (i.e., the financial effectiveness of a policy) is influenced by two factors, namely the university's credit policy (developed and implemented by humans in a university structure) and the students' behavior (driven by their perceptions within the structure).

4.2 *Inductive and Deductive Reasoning with Triangulation*

Within post-positivism, the approach adopted in this study was a convergent, parallel, mixed method by collecting (i) qualitative data interpreted by *inductive* reasoning and (ii) quantitative data, which was interpreted

deductively. Triangulation was applied to combine and interpret the results.

The qualitative research method is a constructive and interpretative approach that is holistic and aims to understand society and social life better. On the other hand, the quantitative method stems from a positivistic worldview best captured in numbers and counting things (Watkins & Gioia, 2015). A mixed method approach combines the above, where the qualitative and quantitative methods are combined to produce answers on both, where a single reality is assumed, and multiple realities are constructed. Therefore, a mixed method enables an evaluation to be attentive to or inclusive of more stakeholders' concerns and value stances than a single-method approach (Greene, 2002).

A theoretical framework and two theories were adopted to conceptualize the investigation. A qualitative study was done to reach the second secondary objective of the study, namely, to analyze and compare the (i) published credit policies and (ii) annual financial statements of the selected South African universities. The portfolio theory of accounts receivable provided a framework and criteria to investigate this objective. As a portfolio is a set of assets, portfolio management in accounts receivable is the action taken to manage all aspects of the university that influence the level of accounts receivable. This, firstly, includes the credit management policy¹ itself, which deals with many different aspects, from determining who will get credit, the allowed payment period, the collections of debt, evaluating the liquidity of receivables accelerating, and the cash handling from accounts receivables holders (Ngugi, 2015).

Secondly, to measure how effective the policy is, several financial ratios are calculated and interpreted from the financial statements, including (i) accounts receivable collection period, (ii) accounts receivable turnover ratio, (iii) bad debt to tuition fee revenue, (iv) allowance for credit loss to accounts receivable, and (v) accounts receivable to current assets ratio (Correia et al., 2011).

To address the third secondary objective, two more theories were selected to serve as a lens to interpret students' perceptions of student debt and their personal financial management skills. The institutional theory was selected to contextualize the former, and the relative deprivation theory of justice was selected for the latter. The institutional

¹ The elements included in the portfolio were also used to prepare a questionnaire to test students' perceptions quantitatively on their universities' credit policy.

theory to interpret the students' perception of student debt provides valuable procedures for investigating organization-environment associations, emphasizing the social rules, expectations, norms, and values as the sources of pressure on organizations. According to Tolbert and Zucker (1999), the institutional theory assumes that individuals unquestionably accept and follow social norms. This theory further assumes that individuals' lack of behavioral resistance is based on their personal interests. The procedure of social influence processes, such as simulated or normatively based conformity, might alleviate or limit independent decision-making.

The relative deprivation theory of justice to interpret students' perceptions of their personal financial management skills were developed by Davis (1959). This theory is based on comparisons between what people want and have and what they expect to have. Thus, the more significant the overlap between expectation and outcome, the greater the perceived fairness. Because of the payment of tuition fees, students' expectations of their university experiences could change, resulting in greater levels of perceived unfairness in instances of disparity between such expectations and the realities of their experiences. In this regard, Jones (2010) expects that changes in the universities' tuition fees may lead to changes in students' expectations. This implies that an increase in fees will result in higher student expectations. For example, they may demand better quality services from their university and expect that more resources are channeled directly or indirectly into their favor. When students experience not sufficient improvement in service quality and/or if resources are not focused on the areas they regard as highly important, they may complain about demanding better value.

From this theory, it can be deduced that when tuition fees increase without improvements in the universities' services and quality of education, the gap between students' expectations and actual outcomes is expected to result in greater levels of perceived injustice for those students paying higher fees.

Finally, triangulation was applied to combine the results of the mixed method approach. Triangulation is when researchers converge qualitative data and quantitative data to construct themes in a study (Given, 2016). Furthermore, triangulation enhances the validity and trustworthiness of the study. It infers that the different data collection methods provide different but also corresponding insights into the same empirical phenomenon (Modell, 2009).

4.3 *Mixed Method*

As already mentioned, the choice of the study was a mixed method approach. That means that multiple strategies were followed to gather data. Archival research was chosen in this study to conduct the qualitative part. Therefore, documents were collected from the five universities under investigation, which include the credit policies and the published financial statements. Those documents meet the inclusion criteria of this study and provide applicable data for capturing some of the essence of the universities' credit policy and their implications on credit management and students' perspectives (Given, 2016).

For the quantitative part of the study, a survey strategy was employed. That included a questionnaire with specific close-ended Likert-scale questions, structured into four sections, which enabled the researchers to test this data collection instrument's reliability and validity (Kumar, 2011). The questionnaires were handed out to students at the selected universities to test their perceptions/attitudes toward the credit policy, student debt, and personal financial management.

4.4 *Data, Data Collection, and Analysis*

Qualitative Data (Archival Research)

For the archival research, document analysis using documents from five selected South African Universities of Technology was performed. These documents were obtained from the official websites of the universities and firstly comprised all the available information about credit management practices and student accounts. Secondly, audited financial reports and the published statements from the universities' websites were downloaded.

Those documents are regarded as reliable since that communication is intended to convey and disseminate the student accounts management processes. Furthermore, since they are part of the official information, it implies that universities' management or councils approved them. The principal researcher assessed the documents, including attempting to check for completeness and comprehensiveness.

Data analysis is centered on systematically exploring the data for content and meaning, which relates to the implication of student accounts. Data analysis was done, which involved a coding process in breaking it down into critical issues, which were converted into themes

and sub-themes. This process required examining, comparing, conceptualizing, and categorizing the data. This thematic analytical process of the qualitative data helped describe and explain social phenomena (Pope et al., 2000), i.e., some aspects of the policy implications on student accounts and credit management at the selected universities.

Prior to the document analysis, a literature review was conducted to conceptualize meaningful emergent themes such as universities' credit policies and effectiveness. From the literature, five themes and several sub-themes were distinguished. It was helpful that the documents could be considered carefully to detect relevant reflection and construct social reality, i.e., the policy implications on student accounts and universities' credit management. Blaxter et al. (2010) validate using a pragmatic illustration that documentary analysis proceeds by conceptualizing from each document those elements considered significant or relevant and assembling the findings or setting them alongside others, which are considered related.

Quantitative Data (Survey)

Quantitative data were collected using a newly developed questionnaire with the literature review providing a basis for the design of the questions. When formulating the questionnaire items, principles around questionnaire and scale construction were considered. The questionnaire consists of four sections which are described briefly below.

- **Section A** 30 questions focused on attitude and perception toward student debt and were guided by a study by Universities, UK (2005), a survey of higher education students' attitudes to debt and term-time working and their impact on attainment.
- **Section B** measured the awareness of the credit management policy on student accounts and consisted of 23 questions. The questions were developed following the literature on accounts receivable management.
- **Section C** comprised 24 questions on personal financial management, which were adapted from the study conducted by OECD's (2011) international network on financial education measuring financial literacy.

- **Section D** aims to seek the participants' demographic information and profile of information relevant to student accounts credit management policy and comprises 13 questions.

The questionnaire was piloted to eliminate bias and ensure the validity and reliability of the questions. The purpose of the pilot study was to (i) determine the feasibility of the study, (ii) test the reliability and validity of the instrument and trustworthiness of respondents for data collection in the main study, (iii) establish how appropriate, understandable and practical the instrument is, (iv) address any problems prior to the main study, and (v) to check the time required for the completion of the questionnaire.

After the pilot study, some minor changes were made to the questionnaire. The questionnaire as a measuring instrument was also tested for its internal reliability. A Cronbach alpha score of above 0.70 was achieved across all the questionnaire sections.

With the questionnaire ready for the main study, the deans and heads of departments were contacted to assist with the ethical clearance application at each university. E-mail and telephone conversations were used to explain the purpose of the questionnaire, the potential participants, and how they could assist in the data collection process. Their approval of the survey was required to ensure that the questionnaire description to the authorities and students was unambiguous. Lecturers involved in third- and fourth-year teaching were targeted to distribute the questionnaire to students during a contact session. Planning this process was essential to ensure that there was little interference with teaching time.

Only senior students, i.e., third year and above, were selected to complete the questionnaire. This decision was based on the assumptions that they have experience with student debt, handling accounts, and probably have accumulated debt at their institution.

Appointments were made with the relevant authorities at the beginning of the year. This was to ensure that the fieldwork took place at the same time at all five universities. The data collection took place just after the students registered for their studies. That was to ensure that their experiences were still fresh in their minds. During that time, some students were still involved in negotiating to be registered because of financial exclusion. This crucial time of data collection is vital to understanding the context of the responses obtained in the study.

The data collection occurred during a turmoil period, just after the #FeesMustFall protests from 2015 to 2016. This was after the President of South Africa, honorable Jacob Zuma, announced the establishment of a Higher Education fees commission to probe the possibility of fee-free higher education in South Africa.

The investigation involved a questionnaire administered in hard copy across the universities. Hard copies were the most appropriate since the distribution and completion took place during tutorial time. A total of 1382 questionnaires were completed, considered as a sufficient sample size. However, it is notable that this number represents only a fraction of all the potential student responses.

After the fieldwork was completed, all the questionnaires were scrutinized to ensure they were complete and suitable for further analysis. All the data were captured on a single Microsoft Excel spreadsheet in preparation for further statistical analysis.

The first statistical analysis was to test for the internal reliability by means of a Cronbach alpha score for Sections A, B, and C of the questionnaire. After that, descriptive statistics and exploratory factor analysis were done to group questions within a section into smaller sub-sections, namely factors. A frequency distribution analysis was performed for Section D, the participants' demographic information. Correlation and regression analysis were applied to test for associations between different factors. Finally, various analyses of means, i.e., analysis of variance (ANOVA) and t-tests, were done to determine associations between factors and demographic variables and associations between the selected universities.

5 RESEARCH EVIDENCE

5.1 *Qualitative Data (Archival Research)*

To reach the second secondary objective, a thematic analysis uncovered five themes pertinent to the phenomenon of policy implications of credit management on student accounts: (i) encouragement to settle debt, (ii) conveyance or communication of procedures, (iii) implementation of credit management, (iv) recovery of deferred debt, and (v) effectiveness of credit management policy and inclusive credit management. Table 1 reports how the five universities apply the first four themes (including sub-themes), i.e., A, B, C, D, and E. Each of the themes was qualitatively

Table 1 Results of the qualitative investigation

<i>Themes and sub-themes from document analysis</i>	<i>University</i>				
	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
1 Encourage to settle debt	a	c	c	m	c
2 Conveyance or communication of procedures	a	m	m	a	c
3. Implementation of credit management					
3.1 Credit payment period	a	m	c	a	m
3.2 Interest charged	a	c	a	a	c
3.3 Methods of payment	m	m	a	a	m
3.4 Registration (initial up-front) fees payment	m	a	m	m	m
4. Recovery of deferred debt					
4.1 Acknowledgment of debt	a	a	m	m	c
4.2 Governing administrative issues	m	c	a	m	c
4.3 Debt collectors (agencies)	c	m	a	m	m
5 Effectiveness of credit management policy					
5.1 Accounts receivable collection period	5	3	1	2	4
5.2 Accounts receivable turnover ratio	5	3	1	2	4
5.3 Bad debt to income	5	3	1	2	4
5.4 Allowance for credit loss to accounts receivable	4	2	1	2	5
5.5 Accounts receivable to current asset ratio	2	5	1	3	3

categorized as to whether the policies are relative to each other, regarded as aggressive (stringent) (a), moderate (m), or conservative (lenient) (c).

The second part of Table 1 exhibits the effectiveness of the universities' credit management policies in terms of five financial ratios. The universities were ranked 1 to 5 according to each ratio's effectiveness.

5.2 *Quantitative Data (Survey)*

To reach the third secondary objective, some quantitative analyses were done. The descriptive statistical analysis of the respondents' perceptions specified findings, namely they: are troubled about their debt and are concerned about the accumulation thereof; indicated that tertiary education should be free for all; they are not satisfied with the accomplishment of the student credit management system of their respective institutions; admitted that they are not familiar with their institutions' student credit management policy; exposed that they do not receive fees statements timeously from their institutions; recognized the importance of

sound personal financial management; and indicated there is inadequate management of personal finances by their parents and themselves.

Exploratory factor analysis was applied to Sections A, B, and C of the questionnaire to analyze students' perceptions of student debt, credit management, and personal financial management. The 77 questions in the questionnaire were reduced to nine factors: (i) student debt implications; (ii) reaction to student debt; (iii) attitudes toward student debt; (iv) implications of credit management; (v) communication of credit management; (vi) effectiveness of credit management; (vii) personal financial management attitudes; (viii) personal financial management planning; and (ix) personal financial management control. This analysis was also helpful in determining the internal reliability of the questionnaire calculating the Cronbach's alpha coefficient.

Correlation and regression analyses were performed to test for any significant relationship between the nine above factors. Where significant relationships were detected, further comparisons were further explored.

Against expectations, the study found some negative correlations, for example, between student credit management and student debt. Similarly, a negative correlation was found between students' personal financial management and student debt. Finally, a negative correlation was also found between students' credit management and their personal financial management.

The regression analysis exposed some relationships. For example, the implications of students' and their attitudes toward student debt negatively affect the overall implementation and effectiveness of their institutions' student credit management; there is a significant positive relationship between student debt and the communication of student credit management; there is a positive relationship between the planning and control of students' personal financial management and student credit management; a positive relationship exists between students' attitudes toward debt and their attitudes toward personal financial management; a positive relationship was also found between students debt and their planning for personal financial management; and the implications of student debt and the attitudes toward student debt have a negative relationship with how students control their personal financial management.

The analyses of means (ANOVA and t-test) have shown statistically significant and practical differences between the universities in the following sections, namely student credit management, personal financial

management, and student debt. Finally, the analysis also found statistically significant differences between students' (i) perceptions of their debt, (ii) their personal financial management, and (iii) their institutions' credit management and some of the demographic variables.

6 RESEARCH CONCLUSION

To answer the research question and reach the fourth secondary objective, the qualitative and quantitative results were integrated using data triangulation to thoroughly answer any questions and gain a more robust and meaningful picture of the research problem.

The rationale of triangulation was also to increase the validity and trustworthiness of the constructs of the study. For example, the results of the quantitative analysis became more meaningful when interpreted in light of critical qualitative information and vice versa. All the qualitative and quantitative findings, interpreted within the context of structuralism/humanism through the lens of the selected theories, were separately listed around the research question. This was helpful in establishing which of the qualitative results link to which of the quantitative results and concluding how those two approaches support each other.

The qualitative and quantitative analysis revealed that South Africans do not contemplate the intrinsic value of education. Authorities such as the South African government and universities' management should be concerned about the universities' current high student debt, which originates from uncontrolled students' spending habits rather than being embedded in poverty, unemployment, and inequality.

Reflective findings on personal financial management must inspire students and their parents to be introspective regarding the underlying factors contributing to student debt at universities and take responsibility rather than shifting the blame to universities and the government.

The conclusive finding of this study confirmed that debt is a significant impediment to South African households when it comes to investing in higher education. This problem can only be solved if there is a paradigm shift toward investing more in higher education by various stakeholders, for example, the South African government, the private sector, and individual students and their parents.

The study concluded that policy implementation of student accounts on credit management policy at selected South African universities relates to the prevalence of the nine factors explored in the quantitative study.

The various stakeholders—authorities, policymakers, the private sector, and individuals—will undoubtedly benefit from the guidance offered to better prepare for higher education financing.

7 CONCLUDING REMARKS ON THE RESEARCH PROCESS

The study presents theoretical and practical contributions to the credit management of student accounts and will assist policymakers in policy reforms and strategic and operational planning. This study was embedded with practical empirical experiences to consider the unique underlying reflections.

Firstly, the study could not have been conducted without obtaining ethical clearance and gatekeeper permission from each university under study. Although this was a requirement to ensure that the study was conducted in compliance with ethical considerations, it was a mammoth task. Each university is unique, and there are different bureaucratic protocols to be observed. This process was time-consuming and required patience from the researcher. Secondly, the universities are in different geographical locations, requiring a substantial budget to collect data. The budget included travel costs such as car rental, flights, and accommodation. Thirdly, the study covered the cutting-edge debates within South African higher education. Data were collected after the #FeesMustFall student-led protest movements began in mid-October 2015 in South Africa and continued in the subsequent years. The researcher was considerate of the tension that still prevailed on campuses. Many students were still grappling with financial exclusion, and data was collected prominently during the registration period.

After completion of the study, the primary researcher had a thorough understanding of the plight of the students and the dilemma of the universities striving to be financially sustainable. The researcher, therefore, initiated funding projects at two universities included in the study to assist student funding. More than R20 million has been generated from 2019 to date, and these projects are ongoing. This initiative has already yielded positive results since students were financially assisted in completing their studies while the universities alleviated and curbed their student debt.

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Analyzing White Maize Hedging Strategies in South Africa

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1 INTRODUCTION

A price risk management decision is one of the more difficult decisions maize producers are confronted with every season. Maize producers not only have to contend with producing a crop, but also selling that crop at a profitable price at the end of the production year. Since maize is sold across the globe, and South Africa is one of the smaller producers in the world, South African producers are price takers for their product. Under the wrong set of conditions, it is possible to have produced a crop with high input costs, only to sell it during the harvesting season for prices below those input costs. This is possible because the prices of input costs too are often dictated by events that happen outside the country.

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Given these uncertainties, the prudent maize producer does well to hedge his/her produce to ensure a selling price that exceeds all input costs and imputed rents. Although the futures market is probably the most effective way for a maize producer to mitigate price risk at any given time, it does not make it any easier to make price risk management decisions. These decisions could have a significant effect on the profitability of maize production. This is not only due to producers failing to utilize available hedging tools, but also due to large cash flow losses because of the hedging process itself.

Maize producers are continuously instructed by specialists, consultants, commodity brokers, and marketers—to name but a few—on how to hedge, how much to hedge, and when to hedge their produce, making use of several price risk management strategies that employ derivative instruments (Cass, 2009). Regardless of all the available information, evidence shows that maize producers still hedge poorly (Dorfman & Karali, 2008). This negative sentiment has remained part of the stark reality of producer hedging since the ability to do so in the mid-nineteen nineties. As a rule, producers seem to postpone their hedging decisions for as long as possible, especially if the decision is only dependent on the individual instead of being a requirement set by production input financing institutions (Swanepoel, 2018). This behavior is obviously counterproductive, and the intelligent producer will hedge the price of their product to ensure the best possible realized price. The question that originates from this situation is twofold: Why do maize producers not make use of the available tools to hedge price risk, and what would improve the uptake of hedging among maize producers?

To investigate the reasons why maize producers avoid the use of derivative contracts for hedging price risk, the researchers had to adopt a mixed methods approach, and both quantitative and qualitative investigations are necessary. To understand why maize producers in South Africa seem to avoid using the derivatives market, a qualitative approach was appropriate. This part of the research relied on data gathered from previous studies as well as interviews with maize producers and other market participants in the maize market. From the initial investigation, several insights came to the fore.

Making use of derivative contracts for hedging price risk depends on the individual maize producer's attitude toward risk, as well as the financial situation of the farming operation, which may or may not render them able to afford the costs of each risk mitigation method (Akcaoz & Ozkan,

2005). This is clearly a subjective view on the part of the individual maize producer stemming not only from their own experience, but also from the anecdotal evidence of those around them as well as previous generations. This necessitated an ethnographic strategy during the fieldwork stage (interviews) of this research process. The reason for distrusting the market is often clear from the narratives of these producers and following an interpretivist philosophy was therefore the best way to make sense of the results.

Despite the obvious risks of not hedging price risk, and these price hedging tools having been available for more than two decades, maize producers are still reluctant to use them. Mofokeng and Vink (2013) confirmed that after 15 years of deregulation, only 35 percent of the South African producers in their sample made use of price risk management instruments available to them. Results from Ueckermann et al. (2008) also indicated that maize producers' choice to use derivative instruments is influenced by their own prediction of daily market prices, trends, farm size, and geographical characteristics.

Besides the factors discussed here that might play a role in the unwillingness of producers to make use of derivative instruments, another factor should be considered. The use of modern-day derivative instruments is a relatively new development in South Africa (Mofokeng & Vink, 2013). Agricultural commodity producers in countries such as the USA were able to hedge their produce for more than 150 years. In contrast, the South African Futures exchange (SAFEX) was only established in 1987 after a long history of state intervention. After 60 years of fixed prices as determined by the former maize board, the responsibility of the marketing of maize was suddenly placed in the hands of individual producers (Bown et al., 1999). This sudden new set of rules prompted maize producers to acquire knowledge and an understanding of abstract derivative instruments. Maize producers also needed to learn how to evaluate the effect of factors, such as crude oil prices, local and international supply and demand factors, currency fluctuations and external factors like equity market volatility or financial crises on the South African commodities market.

Reasoning inductively, this goes some way in explaining the reluctance of maize producers to make use of derivative instruments to manage their price risk. This reluctance gives rise to maize producers ironically becoming more "risk averse" to derivative instruments but adopting high-risk strategies, like selling their crop in the cash market after harvest when

supply is at its highest and prices tend to be lower (Strydom et al., 2010). Research has shown that an important factor influencing a maize producer's willingness to adopt the use of derivative instruments is their risk perception about daily market prices (Ueckermann et al., 2008). This suggests that, if their understanding of derivative instruments and the reliability and efficiency of price formation expectations could be improved, maize producers may become more willing to participate in the derivatives market with the desired outcome of reducing uncertainties and, ultimately, their price risk. It is, therefore, clear that one of the critical determinants of an optimal strategy is the maize producer's understanding of the associated risk and the purpose of a hedging strategy.

To this end Strydom et al. (2010) and Venter et al. (2012) tested the benefit of implementing some form of basic hedging strategy, as opposed to selling the whole crop in the cash market. They deployed stochastic efficiency in the form of the Stochastic Efficiency with respect to a Function (SERF) and the Cumulative Distribution Function (CDF) to determine the possible benefit of deploying some form of hedging strategy versus adopting no strategy at all.

In a related study, Jordaan et al. (2007) measured the price volatility of field crops in South Africa. They found that volatility changed throughout a production season and proposed different hedging strategies for the different periods of varying volatility to mitigate the different levels of risk. In terms of white maize, they found highly leptokurtic behavior in the volatility, which indicated that the conditional standard deviation of white maize price returns was not normally distributed. Considering this, it was deemed meaningful to deploy a ranking mechanism for hedging strategies by means of specific measures that should account for the presence of non-normality. This will augment the findings during the interpretivist section of the research and add robust quantitative findings within a positivist framework to put the results into context. Given the current results from the literature, it is reasonable to assume that the use of derivative contracts for the purpose of hedging price risk will increase as maize producers are offered a transparent strategy that renders consistent positive results.

2 RESEARCH PROBLEM

The problem this study aims to solve can be broken into three critical avenues of investigation. Firstly, without a hedging strategy, whether on a regulated or over-the-counter market, South African maize producers

cannot remove or partly reduce their price risk. Secondly, without the necessary knowledge of how to hedge their produce, South African maize producers may remain reluctant to implement any form of hedging strategy with confidence. Thirdly, because of the variability in the success of hedging strategies over time, South African maize producers find it difficult to know which hedging strategy should be followed in a particular production year. The indiscriminate application of one type of hedging strategy over another will lead to a lower success rate.

3 RESEARCH QUESTION AND OBJECTIVES

Given the problem statement, it was possible to formulate the following broad research questions: First, whether it would be possible to identify an optimal hedging strategy for different seasonal price formation expectations by grouping different production years based on specific influential price determinant factors? Second, whether it would be possible to rank, and more conclusively determine optimal white maize hedging strategies by developing a ranking measure or criteria? Third, could greater clarity on the success of hedging strategies by means of using derivative contracts improve the uptake of hedging practices by South African maize producers?

To answer these questions, the objectives were divided into steps. The first step was to determine from both the literature and market participants, why maize producers might be hesitant to use derivative contracts to hedge their price risk. During the second step, the influential price factors to be included in an analysis that makes the comparison between production years possible were identified. This would make it possible to link previous and upcoming production years by means of historical and recent factor data to establish expectations of price formation for any upcoming production year. For step three, derivative-based hedging strategies were identified from previous studies that could be applied to hedge the current production year given the category the current production year falls into. These three steps formed part of phase one and are the qualitative section of the research. The results of these three steps were interpreted inductively in that broad general conclusion could be drawn from them.

The second phase of the research comprised another three steps of which the first was to determine the daily realized strategy price for each of the hedging strategies during each of the production years from 2003 to 2018. This is an objective result based on mathematical calculations.

Once these values were calculated, the next step was to compare the return results of each of the implemented strategies for each of the 16 production years by means of appropriate ranking measures to determine an optimal strategy for each production year. The first two steps of phase two comprised the quantitative section of the research, and the results of these two steps were interpreted deductively. In the final step of phase two, a decision-making model (filter model) was developed and tested that would enable the linkage of similar production years based on similarities in the influential price determinant factors at a specific point in time.

4 RESEARCH DESIGN

When considering Saunders' et al. (2009) recommend use of the research onion in the choice of data collection techniques and analysis procedures, all research can be approached from four main philosophical standpoints; positivism, post-positivism (critical realism), interpretivism, and pragmatism. To answer the research question and thereby solving the research problem, this study had to tackle the problem from two main philosophical standpoints.

The main problem highlighted in the study is the fact that most maize producers sell their produce in the cash market at the end of the harvesting season. Because of supply and demand side dynamics, this is often the lowest point in the price cycle for maize. It, therefore, leads to a curious situation where the seller of a product could drastically improve their chances of selling at higher prices by simply making use of available hedging instruments to price their produce before harvesting, but don't make use of this opportunity.

To address this problem, the researchers had to adopt a post-positivist paradigm since it embraces interpretivism and positivism. An interpretivist point of view is to try and understand why the reasonable seller would choose not to make use of the opportunity to make more money for their produce. Positivist research would also be necessary for the researchers to realize that the opinions of sellers would be based on facts about the profitability of hedging strategies over time.

4.1 *Philosophies*

To reconcile the apparent anomaly of producers selling their product at suboptimal prices while mechanisms are in place to enable them to easily sell at better prices, the researchers adopted a philosophy of post-positivism to solve this real-world problem. For maize producers who do make use of these contracts, it forms a part of their regular business activities. So, in the context of this research, an interpretivist philosophy meant that the first phase (step one) of the research approach included interviews with maize producers and other market participants on their unwillingness to hedge their price risk using derivative contracts. There was a strong focus on these maize producers and their perceptions on the market. The evidence was further augmented from similar findings in the literature.

Since the use of derivative contracts as hedging instruments are fundamentally easy to execute, the reason for not using them does not lie with the way the derivatives market operates. When looking at the problem from the paradigm as a view of social reality—as explained by Burrell and Morgan (1979)—we see that it is the perception (humanistic worldview) of the maize producers that making use of the derivatives market is too risky.

However, current research on the topic suggests that maize producers would be more inclined to make use of derivative contracts if there was proof that using these contracts would render more predictable outcomes (Ueckermann et al., 2008). The uptake of derivative contracts as hedging price risk in the maize market is, therefore, influenced by two factors—maize producer's distrust of the market (driven by their perceptions within the structure) as well as the efficacy with which hedging strategies can be executed to provide a hedge against low prices (driven by the structure itself).

To fully solve the problem stated above, the philosophy of interpretivism was supplemented with a positivistic approach in the second phase of the research. Here, testing the efficacy of several trading strategies against objective benchmarks meant the application of mathematical calculations to determine whether certain trading strategies could be employed profitably on a consistent basis regardless of the production season (steps four through six)? For research to fall within the positivistic approach, fixed concepts must be determined which is based on measurement and observation. The setting of such fixed objective benchmarks against which measurements will be made necessitates definitions of both

profitability and consistency. For this study, profitability was defined as a final price realized by a hedging strategy that exceeds the price realized in the case where prices were realized by selling the produce outright after harvesting. Consistency was defined as outperforming the strategy of selling the produce outright after harvesting in more production seasons than not.

4.2 *Research Approach*

A mixed research approach was followed in that both qualitative (interpretivist) and quantitative (positivistic) data were utilized in this study. To understand the full bearing of the research problem as it is currently experienced in the market, data was acquired both from the literature and from interviews with market participants in the form of both maize producers as well as agricultural commodity traders (steps one through three of phase one). The information gathered in this way was interpreted by *inductive* reasoning, in that conclusions were drawn from a likely (but not certain) premise from specific and limited observations.

To provide an in-depth understanding of the problem as faced by maize producers, the history of both the development of agriculture and formalized markets was scrutinized. These investigations highlighted the struggle of maize producers throughout the war at the turn of the twentieth century as well as the droughts and the global depression that followed in the 1930s. It is these events that lead to the institution of a fixed price system to help farmers secure a price above the cost of production. This measure mitigated price risk and allowed farmers to produce crops knowing that they will realize a specific price for their goods. The reason for price fixing by the government (through the maize board) was to ensure food security in the country. The maize board was eventually abolished in the early 1990s, bringing with it renewed uncertainty about the pricing structure of maize in South Africa.

Secondly, to understand why the maize producers distrust the current market mechanism, the history of organized markets was also under investigation. Since this research had to investigate the reasons for maize producers' current reluctance to make use of the derivatives market, the qualitative research method was interpretative in nature and targeted the understanding of these market participants.

The quantitative methods that branch from a positivistic worldview were captured in the objective determination of the numbers (steps four

and five of phase two); determining whether hedging strategies by means of derivative contracts can be implemented successfully over time. The quantitative data in the form of maize prices (futures contract prices) as well as options prices was interpreted *deductively*. To gauge the success of the result, *abductive* reasoning was needed to determine whether better clarity in the outcomes of hedging strategies would indeed increase the use of these strategies by maize producers. Triangulation was applied to combine and interpret the results.

Once it was clear why maize producers were hesitant to make use of derivative contracts, the research pivoted to exploring the possibility of providing a solution to the main concern these producers had—not being able to fix a price for their produce above the spot price at delivery at the end of the harvesting season on a consistent basis.

To answer the research questions, and thereby addressing the problem, several goals were set and divided into steps. To achieve the first goal the researchers had to review the available literature on the drivers on price formation in the maize market. This information was corroborated by confirming the findings with traders on SAFEX (step one).¹ After defining the key drivers of price, it was necessary to measure these drivers over time to cluster them into categories. This was necessary for meeting the second goal which was to identify several different types of production seasons with unique attributes. A cluster and percentile rank groupings method in the form of an SPSS Two-Step Cluster analysis method was applied to link different production seasons, based on influential factor similarities, thereby characterizing the market (step two). This was important because it is necessary to link previous and upcoming production years by means of historical and recent factor data to establish an expectation of price formation for any upcoming production year (goal two).

After clarifying what drove maize prices, and how these factors change over time, the next goal was to identify derivative-based hedging strategies from previous studies (step three). Although these strategies can all be applied in every production season, they will exhibit varying degrees of success, and it was, therefore, important to determine which strategies could be applied to ensure success given the category the current production year falls into. These hedging strategies (ten in total) were tested for

¹ Traders on SAFEX represent both the buyers and sellers of maize through the use of futures and options contracts. They are, therefore, representative of maize producers and food companies.

their ability to outperform the realized price at the end of the harvesting season (step four). Success was defined as a hedged price that exceeded the realized price at the end of the harvesting season. The strategies were ranked from most successful to least successful for every production season under investigation (step five). Not all hedging strategies were able to outperform the target price in every production season—a result that was expected.

The next step—step six—was to identify which hedging strategies were the most successful for each of the production season categories. This was done by compiling a decision-making model (filter model) that would enable the linkage of similar production years based on similarities in the influential price determinant factors at a specific point in time. The linkage of production years should function to establish a more probable price formation expectation for a developing season so that a more optimal hedging strategy can be used given the seasonal outlook.

Finally, the filter model could be used to test the hypothesis that a superior hedging strategy can be identified early enough in the season to give maize producers enough time to deploy it. This was achieved by using the cluster analysis results to identify the category a new production season would fall into, and then running the hedging strategies fitted for that production season and recording the final realized price—comparing it to the realized price at the end of the harvesting season.

4.3 *Strategy and Choices*

As mentioned before, this study employed several methods of investigation. The qualitative part of the study involved interviewing market participants about their perceptions of the efficacy of the derivatives market as hedging instrument and performing an in-depth literature review to determine why that view is still held today. For the quantitative part of the study, several quantitative tests were performed to reach the research goals discussed above.

4.4 *Data and Data Collection*

Qualitative Data

For the literature review performed in this research, several seminal works were consulted on the history of agriculture in South Africa as well as the history of the development of the market for commodities. The literature

review served as a basis for understanding how maize producers became hesitant to make use of the formalized derivatives market to hedge their produce. The literature was also consulted to gain an understanding of market efficiency—something that maize producers distrust—as well as price risk management and performance management. Both price risk management and performance management techniques were employed to test the success of the hedging strategies during the quantitative phase of the research.

Quantitative Data

The quantitative data used in this study can be divided into two categories. The first category comprises price data in the form of publicly available prices and values. These data points were not directly collected from people, but in some instances represent people's perceptions of value. The rest of the data is purely objective in so far as it reflects the status quo of measurable things such as the weather and stock levels. These data sets were collected by data aggregators and reflect information that can be viewed as objective data points. The data were collected as is and needed no interpretation by the researchers. The data collected in this category includes the following data series (Table 1).

The second category of data comprises calculated values in the form of profit/loss amounts resulting from trading strategies employed. These calculations were performed in two main ways. First, price data were used to determine entry and exit points in the market. Since the type of strategy to be employed was determined by the type of season the producer faced, the price data was used to form an opinion on the characteristics of each production season. Second, price data were used to test the profitability of several hedging strategies by applying basic mathematical calculations to measure the profitability of each strategy as each of the production seasons progressed. Table 2 provides a summary of the hedging strategies tested.

Table 1 Data source, available time span, and frequency

<i>Type of data</i>	<i>Abbreviation</i>	<i>Data source</i>	<i>Data since</i>	<i>Frequency</i>
White maize continuous contract closing (Rand/metric tonne)	WM-C	Thomson Reuters	20 January 1997	Daily
Import Parity (Rand/metric tonne)	IP	Grain SA	27 October 1997	Daily
Import Parity ratio (Rand/metric tonne)	IPR	Grain SA	27 October 1997	Daily
Export parity (Rand/metric tonne)	EP	Grain SA	27 October 1997	Daily
Export parity ratio	EPR	Grain SA	27 October 1997	Daily
CBOT continuous contract closing price (USD cent/bushel)	CBOT-C	Thomson Reuters	02 January 1973	Daily
USD/ZAR	USD/ZAR	Thomson Reuters	04 January 1971	Daily
Acquisition (Supply) (metric tonne)	SUPPLY	SAGIS	01 May 2000	Monthly
Utilization (Demand) (metric tonne)	DEMAND	SAGIS	01 May 2000	Monthly
Unutilized Stock (metric tonne)	ENDING STOCK	SAGIS	01 May 2000	Monthly
Stock availability ratio	DAYS' STOCK	SAGIS	01 May 2000	Monthly
Southern Oscillation Index	SOI	The Long Paddock	31 January 1876	Monthly
White maize July contract closing price (Rand/metric tonne)	WM Jul ^{***}	Thomson Reuters	01 August 1997	Daily
White maize July contract price option volatility (%)	WM Jul ^{***} Vols	JSE	02 January 2002	Daily
White maize March contract closing price (Rand/metric tonne)	WM Mar ^{***}	Thomson Reuters	01 August 1997	Daily
White maize March contract price option volatility (%)	WM Mar ^{***} Vols	JSE	02 January 2002	Daily

Table 2 Hedging strategy summary

<i>Strategy number</i>	<i>Strategy name</i>	<i>Short description</i>
Strategy 1	Benchmark strategy	Sell all produce during the harvest month of July
Strategy 2	Minimum price strategy	Buy put options for all expected produce during the planting window
Strategy 3	Minimum/Maximum price (collar) strategy	Buy a put option and sell a call option for all expected produce during the planting window
Strategy 4	Three-segment strategy	Sell produce in three equal segments by means of short futures contracts at specific time frames throughout the production year
Strategy 5	Twelve-segment strategy	Sell produce in 12 equal segments or three-week intervals from planting to harvest by means of short futures contracts
Strategy 6	Actively managed put option strategy	Buy put options for all expected produce during the planting window. Actively manage the minimum prices based on the strategy specifications to increase the realized hedge level and to reduce option cost
Strategy 7	Out-of-the-money July contract actively managed synthetic minimum price strategy	Sell all produce by means of July short futures contracts during the planting window, but also purchase out-of-the-money call options against the July futures contract for every short futures contract. Based on the strategy specifications of Strategy 6 but differs in the sense that the out-of-the-money July call options are actively managed
Strategy 8	At-the-money March contract actively managed synthetic minimum price strategy	Sell all produce by means of July short futures contracts during the planting window, but also purchase at-of-the-money call options against the March futures contract for every short futures contract. Based on the strategy specifications of Strategy 6 but differs in the sense that the at-of-the-money March call options are actively managed

(continued)

Table 2 (continued)

<i>Strategy number</i>	<i>Strategy name</i>	<i>Short description</i>
Strategy 9	Three-way options-based strategy	An extension of the minimum/maximum price option-based strategy included as Strategy 3. The strategy adds an additional short put option contract below long put option in the minimum / maximum strategy to reduce option cost even more
Strategy 10	Hedging based on technical analysis	The sell signals generated by means of the composite indicator are used as a timing tool to hedge (sell) expected produce by means of short futures contracts

5 RESEARCH EVIDENCE

This methodological approach determined the order in which results are presented. First, a summary of the clustering analysis and percentile ranking analysis results obtained is presented. These results characterize each historical season under evaluation. The results were used to determine a seasonal price formation expectation based on similar characteristics or circumstances in previous production years. This is instrumental in deciding which hedging strategies would perform better during seasons with specific market characteristics.

Next, the results obtained from the implementation of the ten hedging strategies are presented as obtained from the ranking analyses carried out according to the appropriate performance measures. Finally, the results obtained in an all-inclusive decision-making filter model are reported.

5.1 Percentile Ranking and Cluster Analysis Results

Each of the monthly values of the factors identified to influence the type of season was assigned a percentile ranking value that was then grouped. The results of these percentile groupings (based on monthly values) for each factor were summarized by means of individual tables of which specific results were included to show how the market factor (market price driver) rankings may be compared with the July white

maize futures contract percentile groupings (based on monthly values). However, because of the number of influential factors tested, those results could not be included here. Only the final summary results can be reported.

The results show that five main clusters exist with the first and most relevant cluster consisting of single factor, Import Parity. The second cluster included Export Parity and the rand dollar exchange rate, and the third cluster was made up of CBOT-Corn, White Maize continuous price as well as demand. The fourth cluster included days' stock and ending stock, with the fifth cluster being made up of the Southern Oscillation Index values and supply.

5.2 *Hedging Strategy Results—The Filter Model*

By ranking the hedging strategies for each production season, and clustering production seasons into three different categories, it was possible to identify which hedging strategies were the most successful for each of the production season categories.

6 RESEARCH CONCLUSION

To properly address the research problem in a meaningful way and answer the research question, the research approach was based on three main steps. The first step included an evaluation of the percentile ranking and grouping results, as well as a cluster analysis of the production seasons based on the factors that drive the price of maize. During the second step, the results obtained from the implementation of the ten hedging strategies were evaluated for their efficacy in each of the production seasons under investigation, and the third step involved the compilation of an all-inclusive filter model, with the results obtained from step one and step two combined to establish a decision-making tool.

The filter model is the product of this research and takes the form of a decision-making tool that enables the analyst to identify similarities between production years to arrive at an informed decision as to the more optimal hedging strategy to deploy, given the expected price development of the July white maize futures contract price. The interpretation of results throughout each step required a continuous comparative approach to evaluate the pertinence of each result. This comparative approach, as

a result, ensured that several additional findings were made that enabled meaningful insight into each aspect of the analysis.

The results presented by means of the specific steps followed in constructing the filter model may as a result be seen as the practical manner in which the study achieved two of the main objectives it set out to achieve: first, to link production years based on similarities in the influential market factors, and second, to identify a more optimal hedging strategy to implement given the seasonal price formation expectation (pre-season factors) for a specific production year.

Based on the analysis and interpretation of the 2018/2019 production year factor data provided, the filter model is a meaningful decision making tool that enables the user to evaluate several alternative influential market factor value comparisons of the different production years to derive an informed decision. Arguably, the model also provides the means to compare each individual market factor in isolation to identify seasonal similarities. The filter model should, however, not be regarded as a model that provides a ready-made solution for each filter selected, but the filter model does provide the means to conduct an in-depth scenario analysis to reach a logical conclusion. It should also be borne in mind that the market remains a dynamic and ever-changing environment where changes are incorporated in the influential market factor values. It is, therefore, advised that new data is incorporated into the model as a new production year develops, to establish the means to compare the influential market factor development between similar seasons to confirm or re-evaluate the current course of action.

7 CONCLUDING REMARKS ON THE RESEARCH PROCESS

The methods of analyses before the development of the decision-making filter model only focused on either the evaluation of hedging strategies or the comparison on production years based mainly on seasonality. When considering the importance of the hedging strategies included in this study, context was provided as to how these strategies fit into the current body of knowledge. In terms of the linkage of production years based on influential price determinant factor similarities, several appropriate studies were contextualized.

The success of the result is, however, dependent on the ability of the study to convince maize producers to make use of the current market

mechanisms to hedge their price risk. This meant that the dual philosophies of interpretivism and positivism, embraced by post-positivism, were key to the research process. The problems faced by maize producers are twofold: first, their perception of the market is tainted, and second, changing that perception requires objective as well as subjective evidence.

To address the knowledge gap of the researchers, qualitative data were gathered by means of a literature review as well as interviews with maize producers and other market participants. The results were interpreted inductively as most of the data was influenced by ethnographic tones.

Convincing maize producers to take up hedging their price risk by means of derivative contracts meant that objective empirical evidence was needed. To this end this research had to supplement the interpretivist philosophy with a positivist philosophy. This required the gathering of quantitative data which were used to test the efficacy of different hedging strategies in different production years by means of a newly developed filter model. When considering similarities between the filter model developed during this research process and comparable existing literature, the study by Meyer et al. (2006) also appraised the developments of a South African white maize production season in relation to weather. They proposed an “econometric regime-switching model” to observe how South African maize prices evolved based on three different trade and policy regimes. These regimes depend on expected as well as the current stock levels of white maize in South Africa, which is greatly influenced by weather patterns. As a result, the model only provides input from two factors and does not provide the means to compare seasons based on similarities in all the relevant influential price determinant factors identified in this study.

This is problematic because different factors have a different level of influence on price throughout each production season which is highlighted by Stone et al. (1996), and Meyer et al. (2006). These studies stressed that a model which aims to predict supply and demand conditions in the market should always consider the way through which the influence of one factor may be increased by the joint influence of other factors. They go on to emphasize that derivations based on a specific factor value should not be made relative to a specific single value, but rather relative to values that are linked to certain regimes, developments, or intervals.

As a result, the filter model developed in this study provides the means to establish confirmation between similar seasonal developments based

on consensus between the factors included in the model which may be linked to certain regimes, developments, or intervals. The practical use of the filter model, therefore, builds on the literature and methodological contribution by combining the results of the percentile rank grouping and cluster analysis as well as the hedging strategy results. More specifically, the filter model provided the means to divide production years in different combinations in order to reach a relevant consensus for the July white maize futures contract price development (i.e., upwards, downwards, or sideways). This also provides a specific course of action in terms of the more optimal hedging strategy to deploy, which serves to overcome the subjective opinions of maize producers.

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Developing a Water Disclosure Index: An Integrative Perspective

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1 INTRODUCTION

This chapter focuses on the research methodology of an integrative perspective in developing and testing a water disclosure index. Rajasekar et al. (2006) describe research methodology as a science of learning how to conduct research systematically to enable the researcher to solve a problem. Lopes (2015) adds that scientific research is the fundamental driver for any science to obtain a deep comprehension and knowledge of

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the research problem. To solve the research problem, a post-positivistic research paradigm was selected to embrace the mixed-method data handling approach of the study. Wilson's (2014) "honeycomb of research methodology" was adopted to explain and systematically address the key concepts in the study's design. The honeycomb consists of six key steps. The first three steps focus on the research's underlying philosophy, reasoning approach, and predetermined strategy to handle data. The final steps focus on the data, i.e., the design of what kind of data is required, how to collect the data, and the analysis thereof.

The core of this chapter is to demonstrate the systematic process followed in designing the study to generate new knowledge. This was first to develop a water disclosure index applicable in the food, beverage, and tobacco industry. Special attention was given to incorporating integrated reporting (IR) principles into the index. Secondly, to use this index as a measuring instrument of water reporting practices among companies from Australia, South Africa, and globally selected companies. The water reporting practices distinguish between traditional stand-alone reports versus IR.

Water scarcity, climate changes, the rapidly growing population, and rainfall variability all contribute to water resources that need to be adequately managed (Daniel & Sojama, 2012). Water became a global concern as individuals, companies, and countries became aware of the sustainability of this scarce resource. Sustainability reporting refers to how companies communicate their value creation process through triple bottom line (TBL) reporting, which includes their (i) economic, (ii) environmental, and (iii) social performance (Choudhuri & Chakraborty, 2009). TBL reporting is a tool for companies to satisfy stakeholders' demands to be better informed about their corporate social responsibility (CSR) on environmental and social impacts (Boiral, 2013; Dong et al., 2014).

From the beginning of the twenty-first century, companies tend to separate their environmental and social CSR into distinct non-financial stand-alone reports. De Villiers et al. (2014) argue that those reports became too long and complex to satisfy various stakeholders' expectations on various issues. However, the critique was that social and environmental activities' information was presented in compartments that are not integrated into companies' main activities (Bernardi & Stark, 2018). Consequently, the Global Reporting Initiative (GRI) and The Prince's Accounting for Sustainability Project proclaimed the formation of

the International Integrated Reporting Council (IIRC) in August 2010 (Eccles & Serefeim, 2011). Their task was to investigate the possibility of integrated reporting (IR) as a substitute for the various stand-alone financial and non-financial reports.

Two countries were of interest in this study to test the new index statistically. Besada and Werner (2014) describe Australia and Africa as the most and second most arid continents. Godfrey (2011) argues that Australia's water consumption per capita is the highest in the world, which makes it particularly vulnerable to water scarcity. Similarly, South Africa is also vulnerable as a water-stressed country as urbanization and industrialization have led to demand exceeding the supply (Tewari, 2009). This water scarcity puts pressure on those countries' companies to be accountable to their stakeholders in reporting their social and environmental responsibility (Lodhia & Hess, 2014).

Australian and South African companies operating in the food, beverage, and tobacco industry were at interest. McKinsey and Company (2009) mention that companies in, for example, the food, beverage, and tobacco, pulp and paper, and mining industries are heavily dependent on water and highly exposed to water scarcity. As these industries can negatively affect the environment and, in turn, society (Kemp et al., 2010), they are in the CSR spotlight.

As Mouton's (1996) acronym ProDEC (problem, design, evidence, and conclusion) is central to all the chapters in this book to explain the research process, sections of this chapter are also arranged as such. The following sections present the background, research problem, and objectives. The section after that illustrates the research design, a brief reference to the research evidence, and a conclusion. The study is finally concluded with some remarks on the research process.

2 BACKGROUND

The World Economic Forum (2015) branded the "water crisis" as the most significant global risk. Various initiatives and agencies aim to address this issue by improving water sustainable reporting, for example, The Carbon Disclosure Project (CDP), Global Reporting Initiative (GRI), The Water Footprint Network, The Climate Disclosure Standards Board (CDSB), King IV and The Association of Chartered Certified Accountants (ACCA).

The CDP's Water Disclosure Program provides guidelines to companies to disclose water information and raises awareness of the importance of understanding companies' water-related opportunities and risks. They also emphasize the need to accelerate the progress of water performance benchmarks and standardized measures (CDP, 2015). Furthermore, the Water Footprint Network (2015) suggests that a limitation of the current water reporting is that various risks related to water quality and scarcity are not properly disclosed to stakeholders.

The GRI's metrics related to sustainability are probably the most popular reporting initiative companies use (Fonseca et al., 2012). The GRI G4 guidelines require that companies specify the methods and standards used in their water reporting. However, Danoucaras et al. (2014) report that researchers still question the usefulness of aggregated water information from different sites. Fonseca et al. (2012) argue that GRI-based reporting may mislead the users thereof since it seems that some unsustainable practices are not reported on. Consequently, a better-standardized water reporting framework may assist companies in benchmarking their operations with competitors' activities (Semmens et al., 2013).

Water reporting is part of CSR information. Contemporary, the debate questioning the credibility and completeness of CSR information and its benefits to stakeholders, including investors. In this regard, Michelon et al. (2015) questioned whether the use of the GRI guidelines and the use of stand-alone reports are related to disclosure quality. They found that although stand-alone reports provide sufficient information, their value is diluted as unrelated bits of information "camouflage" the disclosure of important issues.

Stand-alone reporting evolved from corporate social and environmental policies to be included in annual reports (Cho et al., 2015). However, Frías-Aceituno et al. (2013) support the idea of a more pluralist approach that considers transparency, sustainability, ethics, and stakeholders. Nevertheless, they found that only a few of the 750 international companies they investigated adopted IR.

3 RESEARCH PROBLEM AND OBJECTIVES

Hazelton (2013) argues that as water becomes a globally dominant environmental issue, companies are in the interest to disclose their impact on the scarcity and sustainability of their water use. The CDP's (2015)

water report further emphasizes the importance of water sustainability, which found that 65% of the companies in their study's sample face substantive water risks. Chalmers et al. (2012a) conclude that as the world seeks appropriate solutions for its water-related issues, water accounting may contribute to the solution of disclosing relevant water information to stakeholders. However, Chalmers et al. (2012b) warn that various water accounting frameworks may become internationally incomparable and inconsistent as the accounting standards are not regulated. Also, in this vein, IR was developed to overcome some shortages of traditional stand-alone reporting. Still, several previous studies are still questioning IR (Cho et al., 2015; Frías-Aceituno et al., 2013; Perego et al., 2016).

Australia and South Africa are water-scarce countries. Furthermore, companies in the food, beverage, and tobacco industry were also identified as they may negatively affect the environment and, in turn, society. Therefore, Australian and South African companies in this industry are selected for this study, and, in the light that water is a global issue, companies in the food, beverage, and tobacco industry from the Dow Jones Global Sustainability Index (DJGSI) were also included to provide a global perspective and to serve as a best practice benchmark.

Reflecting on the importance of water as part of the water, energy, and food nexus, the call for more research to address this integrated problem has been resonated by several studies, such as CDP (2015), Water Footprint Network (2015), Fonseca et al. (2012), Danoucaras et al. (2014), and Cai et al. (2018).

This chapter aims to demonstrate the methodological research process followed to address the issues as mentioned above. The study's main objective was to evaluate whether the concept of IR and an integrative approach are associated with improved water disclosure in the food, beverage, and tobacco industry.

To reach the main objective, the following two secondary were necessary, namely:

1. Firstly, to develop a water disclosure index for the food, beverage, and tobacco industry; and
2. Secondly, to test whether there is a difference in the water disclosure quality of IR versus non-IR companies.

Since the data were available for Australian, South African, and global companies, a spinoff objective was to test whether there is a difference in the water disclosure quality between these three groups of companies.

A literature review was conducted to obtain knowledge of water disclosure practices to reach the objectives. The literature, including IR principles, was the basis for developing (in three phases) a water disclosure index containing seven constructs, divided into 27 elements. This index served as the measuring instrument for empirical data collected from reports of the selected food, beverage, and tobacco companies. The next step was to test whether there are significant differences in the water disclosure quality of 49 selected companies regarding IR versus stand-alone sustainable reporting (non-IR); and between Australian, South African, and global companies. Now that the problem is identified, the next section demonstrates the research design followed to address the problem.

4 RESEARCH DESIGN

Research is a rigorous and systematic questioning process that aims to describe phenomena to test explanatory theories and concepts (McCusker & Gunaydin, 2015). Rajasekar et al. (2006) also refer to research as a systematic process to discover and interpret or revise theories, behaviors, events, and facts. As already mentioned, this study adopted Mouton's (1996) ProDEC framework as an aid to present the study systematically to unlock new knowledge. With this section focusing on the "D" (design), Wilson's (2014) honeycomb was also adopted to ensure that the design of the methodological process was systematically conducted. The six key concepts are numbered to understand how and where each fit in the research methodology. The concepts are discussed below and include the (i) research philosophy, (ii) research approach, (iii) research strategy, (iv) research (data) design, (v) data collection, and (vi) data analysis techniques.

4.1 *Research Philosophy*

All research is grounded on some underlying philosophical assumptions. Understanding the underlying philosophy helps find the appropriate research method. Furthermore, the selection of a research methodology is determined by the research philosophy or paradigms (Antwi & Hamza,

2015). Scotland (2012) remarks that a paradigm consists of four components, epistemology, ontology, methodology, and methods. Durrheim (2006) adds that the assumptions of the first three components provide perspectives for the researcher to commit to a specific data collection and interpretation method.

The philosophical assumptions/paradigms/worldviews act as the lens through which the researcher sees the world since this shapes the fundamental beliefs that lead the researcher's actions (Creswell, 2014). Sekeran and Bougie (2016) argue that the following four paradigms are the most important in contemporary business research, i.e., pragmatism, critical realism (post-positivism), constructionism (interpretivism), and positivism. Notably, authors use different terms to define or describe research paradigms. Nevertheless, a researcher must adopt a paradigm that is the most appropriate underpinning for the study. Post-positivism was adopted for this study to act as the philosophic worldview lens.

Post-positivism binds the researcher to commit to multiple methods to observe, collect, and interpret data, which aims to verify existing theories and discover new ones (De Vos et al., 2011). It contains elements of both positivism and interpretivism. Serekan and Bougie (2016) explain positivism as the underlying philosophy where objective measures test theories and associations. Nieuwenhuis (2016) argues that interpretivism is also known as constructivism since it accentuates an individual's ability to construct meaning. Creswell (2014) explains post-positivism as where the theories or laws that govern the world need to be tested and refined so that the world can be better understood. This paradigm allows researchers to search for reliable and valid evidence of the existence of phenomena, which is opposed to positivism which claims the absolute truth (Nieuwenhuis, 2016).

Post-positivism was found to be an appropriate philosophic paradigm as it searched for evidence regarding the phenomena of water disclosure practices. The problem of this study was identified as that various water accounting (reporting) frameworks may lead to disclosure inconsistencies and incomparability and that the value of IR is still questionable. The aim was not to generalize the findings. It was to better understand how companies in a specific industry report on water and water-related issues and the phenomena of different reporting practices (IR versus traditional stand-alone (non-IR) reporting) in different countries.

Furthermore, post-positivism is also relevant to this study as a mixed method was utilized to collect, test, and interpret quantitative and qualitative data. The three-phased developed index (measuring instrument) leaned to *interpretivism* where the literature, including existing water disclosure indices, was subjectively interpreted to construct meaning, i.e., to develop a seven-construct index divided into 27 elements. Both quantitative and qualitative data were extracted from the sustainability reports to calculate the water disclosure quality (percentage) of each of the 49 selected companies. A *positivistic* approach was followed to test whether there are significant differences between IR versus non-IR, and the Australian, South African, and global companies.

The results of the above process were brought together through triangulation, which supports post-positivism. That was to find evidence for a better understanding and evaluation of the phenomena of water disclosure.

4.2 *Research Approach*

Scientific research has the distinct feature that it needs theoretical content, which advances into the different reasoning approaches of deduction, induction, and abduction (Wilson, 2014). Both deductive and inductive reasoning is used in basic and applied research, with the argument that theory generation (induction) and theory testing (deduction) are crucial to the research process (Sekaran & Bougie, 2016).

Inductive reasoning follows a bottom-up approach, implying it moves from “the concrete and specific to the abstract and general,” which is a suitable approach where a study field is not well-established (Joubert, 2017). This approach is a creative reasoning mode, which may lead to possible or tentative conclusions (Delpont & De Vos, 2011), which are regularly used in qualitative and exploratory research (Sekaran & Bougie, 2016). The challenge of inductive reasoning is to avoid general summaries and surface descriptions (Graneheim et al., 2017); however, the reasoning must be a process of theory building (Joubert, 2017).

In this study, inductive reasoning was helpful to reach the first secondary objective, i.e., to build from the literature (the specific) a general three-phased water disclosure index for the food, beverage, and tobacco industry. The term “general” implies that the subjective interpretive paradigm, in conjunction with the inductive reasoning approach,

could have led to various outcomes, implying there is not only one correct answer (index).

Deductive reasoning follows a top-down approach, implying it moves from “the abstract and general to the specific and more concrete” or from the “theory to the data” (Joubert, 2017). Deductive reasoning is applicable in quantitative research, beginning with the hypothesis (abstract/general) and moving toward testing or proving it (Delpont & De Vos, 2011). This is a hypothetic-deductive approach for generating knowledge, usually in quantitative and causal studies (Serekan & Bougie, 2016). Serekan and Bougie (2016) note that the central principle of a hypothesis is that it must be falsifiable, which challenges future research to disprove it.

Deductive reasoning helped reach the second secondary objective and the spinoff objective. That was to test the general, e.g., hypotheses that there may be significant differences between the disclosure quality of IR versus non-IR reports; and companies located in different countries. Testing for statistical significance is helpful to arrive at a single (specific) outcome, implying that there can only be one true answer—true or false.

Theories and Contextual Framework

“Research is a process of intellectual discovery, which has the potential to transform our knowledge and understanding of the world around us” (Ryan et al., 2002). Smith (2017) notes that the research approach to address a research question requires some theoretical justification. A theory provides a conceptual frame to understand how things in real life work and it enables the researchers to make predictions in the form of hypotheses (Lynch, 2013). Therefore, in the world of finance, accounting, and business, research offers a methodological roadmap to reasonably understand a business-related problem or achieve solutions for that problem.

In the context of this study, Gray et al. (2014) explain that the concept of accountability is the fundament for sustainability accounting and reporting. In the past various theories have been applied to clarify and explain sustainability accounting and reporting practices. For example, the stakeholder, legitimacy, resource dependence, and institutional theories provide frameworks for CSR accounting research (Bhattacharyya, 2014; Chen & Robberts, 2010). Those are all system-orientated theories that generally share a similar ontological view (Chen & Robberts, 2010; Gray

et al., 1995). Chen and Robberts (2010) state that the core of a system-orientated theory is that society influences the institution in which it operates. On the other hand, the institution influences society.

Chan et al. (2014) argue that the stakeholder and legitimacy theories are the most popular in CSR reporting studies. They were also found the most appropriate for this study as both are interlinked to companies' stakeholders. Although those theories overlap, they bring slightly different insights into studying a research problem (Deegan & Blomquist, 2006). Grey et al. (1995) note in this regard that these theories must be viewed as complementary and not competing with each other. As both conceptualize a company as part of the society it operates in, the legitimacy theory focuses on society's expectations. In contrast, the stakeholder theory concerns different groups (Deegan, 2014).

In this study investigating the disclosure of water in food, beverage, and tobacco companies, the stakeholder theory is recognized as the most prominent, with some support from the legitimacy theory. The motivation is that water disclosure issues are complex and involve various stakeholders, sometimes conflicting interests. Companies in the food, beverage, and tobacco industry consume water, influencing stakeholders (society) and the company itself. The rules and regulations that companies must comply with, the accounting disclosure of water and related issues, and the water management are all closely related to the needs of the stakeholders. For example, a conflict of interest appears when a company pollutes a water source (river, lake), while the local society needs that source for drinking water.

Furthermore, a similar conflict appears where companies in this mentioned industry use water to irrigate their crops, which the society could use for household purposes. Therefore, the company should be efficacious to the expectations of its shareholders and the needs and expectations of other stakeholders interested in the company's social and environmental. To conclude, both the stakeholder theory and the legitimacy theory, as discussed, apply to the study.

At this stage, this is also imaginable to introduce a new theory, the integrative disclosure theory. This theory could be grounded on the interrelationship between the need for food and water and the sustainable disclosure of water and related issues. This possible new theory may create value for stakeholders over the long term, which relates to the aim of the introduction of IR.

4.3 *Research Strategy*

Wilson (2014) and Fouché and Delpont (2011) note that the three research methods, quantitative, qualitative, and mixed method, are classified as the research strategy. According to Creswell (2014), quantitative research is a strategy of examining the association between variables to test theories (hypothesis). He further explains that the variables are measurable, typically on instruments, to enable the statistical analysis of numbered data. Creswell (2014) describes qualitative research as a strategy to understand the meaning of groups or individuals better to recognize a human or social problem, using narrative and descriptive data rather than numbers.

However, both qualitative and quantitative research has limitations. Triangulation may assist with those limitations. This means seeking convergence across qualitative and quantitative methods, which has led to the establishment of the mixed method as a research strategy (Creswell, 2014). The adopted mixed-method strategy includes “research that involves collecting, analyzing, and integrating quantitative data and qualitative data within a single study or multiple phases of a program of research” (Plano Clark et al., 2015).

Johnson and Onwuegbuzie (2004) mention that the mixed-method strategy falls from fully mixed to not mixed (monomethod), implying a partially mixed method is lodged somewhere between. Creswell (2014) identified four mixed-method scenarios, (i) convergent parallel (concurrent), (ii) explanatory sequential, (iii) exploratory sequential and transformative, and (iv) embedded, nested, or multiphase. Another mixed-method strategy classification is presented by Zhang and Creswell (2013) as the processes of connection, integration, and embedding. The latter is where one type of data is embedded within the other.

Both quantitative and qualitative data were collected at the same point in time (concurrent). The embedded strategy is relevant to this study as quantitative and qualitative data were collected for calculating each company's index score.

In calculating the companies' water disclosure index scores, the quantitative data are primarily performance-based, for example, the disclosure of total water consumption, total water discharged, the volume of water recycled and reused, etcetera. Qualitative data, which are less explicit presented in the reports, are, for example, to determine whether a company has developed a water strategy, or, whether a company discloses

water information that could affect value creation, etcetera. The extraction of quantitative data was significantly more dominant than the extraction of qualitative data.

The index score was also used to perform further quantitative analysis, i.e., to statistically test whether there are significant differences in water disclosure between the IR and non-IR and between the companies in the three indices (countries). Therefore, as this study adopted a mixed method, it can be described as integrative, concurrent, and dominant quantitative.

4.4 *Research (Data) Design*

Delpont and Roestenburg (2011) argue that the research (data) design provides the guiding principles to select which data collection method is the most appropriate to solve the research problem. Therefore, the researcher must clearly understand the problem and the objective(s) of how to solve it. Wilson (2014) identifies seven types of data i.e., experimental, case study, action research, cross-sectional, longitudinal, comparative, and archive analysis. The latter was relevant to this study as the content of archival documents was analyzed to extract the required data. In the past, many businesses and accounting researchers applied content analysis as the dominant data collection technique (Beck et al., 2010; Parker, 2005). Steenkamp and Northcott (2007) note that content analysis is primarily utilized to collect data from printed, verbal, and website information to better understand accounting practices.

Content analysis is a “research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use” (Krippendorff, 2004). According to Guthrie et al. (2004), this is a data collection technique by codifying quantitative and qualitative information into predetermined groups/themes to derive patterns integral to the presentation and reporting of information. Egberg Thyme et al. (2013) note that content analysis evolved from only a “counting exercise” to a more qualitative and interpretive paradigm.

It is also important to note that some quality requirements apply to content analysis. Beck et al. (2010) argue that this is not always correct to assume that the quantity of disclosure reflects quality, for example, simply counting sentences or words. Smith and Taffler (2000) explain that both “meaning-orientated” (subjective) and “form-orientated” (objective) analysis are approaches to conducting content analysis. The former

concentrates on the underlying themes in narrative text, while the latter focuses on routine counting (e.g., sentences or words), themes, and concepts. This study utilized both meaning-orientated and form-orientated analysis.

4.5 *Data Collection*

The water disclosure index was developed in three phases by utilizing grounded literature that covers the measuring of water and related issues as well as the following: (i) GRI sector guidance for food and beverage processing, (ii) CDP water disclosure framework, (iii) GRI G3 and G4 guidelines, (iv) GRI 303: water and effluents, and (v) IR principles and content elements.

With the GRI as a basis, the first phase incorporated all the above sources to develop the water disclosure index. That is like the process used by Weber and Hogberg-Saunders (2018). Six constructs/themes were initially identified. The second phase of development involves the description of each construct, adding constructs, adding more information under each construct, moving constructs, and moving information toward a specific construct. That assisted in identifying the elements that should sort under each construct. This phase also included adding a three-point assessment scale to each construct, ranging from 0 to 2, to indicate the minimum and maximum values of water disclosure. The third phase involves rewriting elements into a concise quality description. The final index included the following seven constructs: (i) materiality, (ii) governance and management approach, (iii) water-related impacts in its supply chain, (iv) targets and measures, (v) site-specific information, (vi) risk assessments, and (vii) future-orientated information. Twenty-seven elements were included under those seven constructs. Table 1 summarizes the index by showing the constructs and briefly describing each element.

A manual coding process was preferred above a computer-aided process to collect data for calculating each company's water disclosure index score. The reason is that some companies' reports provide extensive information on interactive web pages, which could be challenging to enter into a computer-aided program. Furthermore, as quantitative and qualitative information was extracted and best practices were identified, careful and in-depth reading was required.

Data were extracted from 49 companies in Australia, South Africa, and globally that are listed in the food, beverage, and tobacco industry of

Table 1 Summary of the water disclosure index (with company performance)

<i>Construct: Sub-theme or element</i>	<i>Mean</i>
Materiality	1: Identify water as a material aspect 1.00
	2: Describe the process and identify stakeholders 0.86
Governance and management approach	1: Environmental management system in place 1.18
	2: Understands the context in which it operates 1.33
	3: Includes water-related aspects in the business model 0.69
	4: Indicates board-level oversight for water 0.82
	5: The company has water-related policies etc 1.20
Supply chain information	1: Identify suppliers causing water-related impacts 0.55
	2: Policy to manage water-related aspects in the supply chain 0.82
	3: Identifies water risk factors in the supply chain 0.98
	4: Understands role players in the supply chain (e.g., nexus) 0.88
Targets and measures	1: Total water withdrawal per source 0.88
	2: Total water discharged 0.65
	3: Disclosure of water quality 0.86
	4: Total water consumption 0.80
	5: Volume of water recycled and reused 0.65
Site information	1: Water-related information for each facility 0.35
	2: Water risk assessments at a geographical scale 0.51
Risk assessment	1: Disclosure of physical water risk 1.39
	2: Disclosure of regulatory water risk 1.06
	3: Disclosure of reputational water risk 0.71
	4: Procedures & methods of water risk assessment 0.96
	5: Stakeholders identified in water risk assessment 0.88

(continued)

Table 1 (continued)

<i>Construct: Sub-theme or element</i>		<i>Mean</i>
Future-orientated information	1: Reports on future-orientated water information	1.16
	2: Identified a long-term water strategy	0.67
	3: Information on which could affect value creation	0.49
	4: How water risk assessment affects future growth	0.53

the Australian Security Exchange (ASX), Johannesburg Security Exchange (JSE), and Dow Jones Sustainability Index (DJSI), respectively. The target population was the twenty largest companies in terms of market capitalization in each of the indices. Twenty-six companies were listed under the industry on the ASX, of which the largest twenty were selected. However, only eighteen companies in this industry are listed on the JSE. One was new without any reports; another was dual-listed on the DJSI and included under the DJSI to compare global best practices. Thirteen DJSI companies adhered to the listed requirements and were included in the study to provide a global representation.

4.6 *Data Analysis*

To reach the second secondary objective of the study, several hypotheses were developed. The main hypothesis is as follows:

H_{main} : There is a significant association between IR and water-related disclosure.

A similar hypothesis was developed to test the difference between IR and non-IR for each of the seven constructs, and for each of the 27 elements as indicated in Table 1.

To test the hypotheses, an analysis of means, in the form of the t-test, was applied to determine whether there is a statistically significant difference between the mean scores of the IR companies and the non-IR companies. As in this case, Pietersen and Maree (2016) explain that the t-test is used when two independent groups are compared based on their mean score on a quantitative variable.

Two relationship analysis was also employed to test the hypotheses. The first was Spearman Rank Order Correlation (ρ), which is designed to use an ordinal level or ranked data (Pietersen & Maree, 2016). A code of 0 or 1 is assigned to a company that adopted and not-adopted IR, respectively. The relationship is measured between this IR status and the index score as a whole, for each construct and each element. The second was regression analysis which examined the relationship between a metric-dependent variable and one or more independent variables (Malhorta, 2010). The dependent variable is the index score (as a whole, for each construct or each element), and the exploratory independent variable is the IR status (0 or 1). As more factors than the IR status may influence the index score, four control variables were also included in the regression model. Except for the country, company size, assurance, and conciseness of the reports were identified as applicable by the studies of Michelon et al. (2015) and Hąbek and Wolniak (2016).

To reach the spinoff objective, an analysis of means in the form of an analysis of variance (ANOVA) was employed. Pallant (2016) explains that this technique is similar to the t-test but is employed to compare the mean scores and analyze the variances between more than two groups. In this study, three groups were involved: the companies included in the three indices (countries). In the cases where significant differences between the countries were identified, Tukey's test was employed to analyze those results further.

5 RESEARCH EVIDENCE

The study's first secondary objective was to develop a water disclosure index for the food, beverage, and tobacco industry. From the literature, an index was developed, as summarized in Table 1.

Quantitative and qualitative data were extracted from the annual reports of the 49 selected companies. Codes (0 to 2) were used to rate each of the 27 elements in Table 1 for the 49 companies. Table 1 also provides the mean score of all the companies' water disclosure scores. A higher score implies a higher disclosure quality and vice versa. These index rating per element was utilized to perform the second secondary objective and the spinoff objective.

Secondary objective two was to evaluate whether the concept of IR and an integrative approach are associated with improved water disclosure in the food, beverage, and tobacco industry. Hypotheses were developed

to test whether there is a statistically significant difference between the companies' IR status (IR = 0; non-IR = 1) and each element, each construct, and the overall index. Of the total of 49 companies, 18 have adopted IR, and 31 did not. To illustrate, only the results related to the overall index are shown.

Table 2 shows that the 18 IR companies outscored the 31 non-IR companies significantly ($p = 0.007 \leq 0.05$). The mean water disclosure score for the IR and non-IR companies is 55.35 and 34.77%, respectively.

The most important in Table 3 is the -0.368 correlation between the IR status and the water disclosure index. The negative value indicates that the disclosure index increases when companies move from non-IR (1) to IR (0). This correlation is statistically significant as $p = 0.000 \leq 0.05$.

The results in Table 4 show that there is not a statistically significant relationship between the IR status and the water disclosure index ($p = 0.297 \geq 0.05$). However, the Beta value (-10.092) and negative t ($t = -1.055$) values indicate that if a company moves from non-IR to IR, the water disclosure quality improves by approximately 10%.

Table 2 Mean difference between IR/not IR groups (*t*-test)

<i>Description</i>	<i>IR (0)/Not IR (1)</i>	<i>N</i>	<i>Mean %</i>	<i>SD</i>	<i>p-value</i>	<i>Effect sizes</i>
Index	0	18	55.35	21.623	0.007*	0.72
	1	31	34.77	28.751		

* $p < 0.01$ (two-tailed)

Table 3 Spearman's correlation coefficients

<i>Spearman's rho</i>		<i>Index average (27 elements)</i>	<i>IR (0)/Not IR (1)</i>	<i>Conciseness (pages)</i>	<i>Assurance</i>	<i>Size (total assets)</i>
Index average (27 elements)	Correlation Coefficient	1.000	-0.368*	0.697*	-0.017	0.664*
	Sig. (two-tailed)		0.009	0.000	0.910	0.000
	N	49	49	49	49	49

* $p < 0.01$ (two-tailed)

Table 4 Comparing the entire water disclosure index with other variables

<i>Model</i>	<i>Unstandardized Coefficients</i>		<i>Standardized Coefficients</i>	<i>t</i>	<i>Sig</i>
	<i>B</i>	<i>Std. error</i>	<i>Beta (β)</i>		
(Constant)	-123.811	43.119		-2.871	0.006
IR (0) / Not IR (1)	-10.092	9.566	-0.176	-1.055	0.297
Conciseness (pages)	5.789	4.069	0.185	1.423	0.162
Size (total assets)	17.207	4.730	0.614	3.638	0.001***
Country_Global	-15.541	10.979	-0.248	-1.415	0.164
Country_Australia	-18.803	10.508	-0.334	-1.789	0.081*

Dependent Variable: Water disclosure index

($R = 0.827$; $R^2 = 0.684$; Adjusted $R^2 = 0.647$; $F = 18.604$); *** $p < 0.01$; * $p < 0.1$ (two-tailed)

Table 5 Results of the Tukey test for the entire water disclosure index

<i>Index: Tukey</i>		<i>Subset for alpha = 0.05</i>	
<i>Country</i>	<i>N</i>	<i>1</i>	<i>2</i>
Australia	20	19.722	
South Africa	16		52.546
Global	13		64.530

The spinoff objective was to apply the water disclosure index as a measuring instrument to compare the water reporting practices of companies in Australia, South Africa, and globally. Table 5 indicates that the mean index score of the global companies listed on the DJSI (64.530%) and South African companies (52.546%) is statistically significantly higher than the Australian companies (19.722%).

6 RESEARCH CONCLUSION

The problem of this study was identified as that various water accounting (reporting) frameworks may lead to disclosure inconsistencies and incomparability and that the value of IR is still questionable. Within the context of the stakeholder and legitimacy theories, this study confirmed that an integrative approach is associated with improved water reporting practices in the food, beverage, and tobacco industry—and proposed a new

integrated disclosure theory. Furthermore, the developed water disclosure index accounted for the integrated nature of water disclosures in the above-mentioned industry. Consequently, the improved water disclosure index could be applied by firms in the food, beverage, and tobacco industry—regardless of whether or not a firm is implementing IR. This study was also evident that the water reporting quality between countries is significantly different.

7 CONCLUDING REMARKS ON THE RESEARCH PROCESS

Constructs and elements included in the water disclosure index were compiled from multiple literature sources which apply to different industries, of which some could be omitted. Only selecting firms in the food, beverage, and tobacco industry listed in South Africa and Australia, water-scarce countries, and comparing them to global best practices of firms listed on the DJSI limited the study's sample size. A decision had to be made between manual and computer content analysis, and the selection of manual content analysis involves individual judgments made by the coder. Measures were taken to enhance consistency involved experienced colloquium, which included a discussion of the water disclosure index and pilot coding of 10% of the sample firms, followed by a comparison and discussion of the results—before further coding commenced.

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Perceptions of School Management Teams on the Influence of Instructional Leadership on Accounting Learner Performance in Secondary Schools

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1 INTRODUCTION

Instructional leadership is a critical factor that influences learners' performance (Vogel, 2018). School Management Teams (SMTs) are seen as the core role players in ensuring that effective instructional practices are

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carried out in schools (Mestry, 2019). Although SMTs might be familiar with their general management roles, the scope of their instructional leadership roles might appear to be mixed as instructional leadership and management of teaching and learning in schools extends beyond the principals (Manaseh, 2016; Mestry, 2019). Sun and Leithwood (2016) confirm that instructional leadership influences learner performance and is different from general school leadership. Thus, SMTs should identify and strengthen their instructional practices to enhance learners' performance.

The SMTs comprise the principal as the core instructional leader at the top level of school management, the deputy principal, and the Heads of Department (HoDs). The principal is seen as the head of SMTs and is expected to manage instructions and influence other SMTs for change to take place (Maja, 2017). This is followed by ensuring that teaching and learning are effectively managed through a collaborative effort with other members of the SMTs, such as the deputy principals and HoDs at the middle-level management. In the context of instructional leadership, the deputy principals and the HoDs play similar roles as the principals, as they are empowered by the principal and ensure that a distributive leadership that facilitates effective teaching and learning is carried out (Maponya, 2015; Mestry, 2017). It then means that the instructional roles of the deputy principal and HoDs might be interrelated with the principal as they also play similar roles to some extent. It also follows that at the lower level, the educators are responsible for implementing teaching and learning with support from the SMTs (Mapiet, 2016). This is an indication that SMTs have diverse instructional leadership roles they play at all levels of management. This justifies the need for this study and the need to adequately identify the perceptions of SMTs in influencing instructional leadership on accounting learner performance in secondary

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school through adopting a pragmatic paradigm with the aid of sequential explanatory mixed-method design. The rest of this chapter covers the background of the study, the research paradigm, techniques, evidence, conclusions, and recommendations.

2 BACKGROUND OF THE STUDY

According to Bojuwoye et al. (2014), accounting learners globally struggle with learning accounting as part of the school curriculum. Edmond (2009) mentioned that many countries such as China, South Africa, Kenya, the United States of America (USA), Australia, and the United Kingdom (UK) have struggled with the approach to teaching accounting as a subject. Ngwenya (2014) postulated that the struggle with the correct approach was due to the absence of instructional leadership practices in teaching and learning accounting. Leithwood et al. (2006, p. 8) affirm that “there is not a single documented case of a school successfully turning around its pupil achievement trajectory in the absence of talented leadership.” Drawing on this suggestion, it can be argued that if instructional leadership and management of accounting can be improved, it could enhance learners’ performance in secondary schools.

In South Africa, poor performance in accounting might be traced back to the absence of instructional leadership during the several curriculum changes that the country’s education systems have undergone for many years. According to De wet and Wollhuter (2009), before 1994, South Africa practiced the Bantu education system, which was characterized by challenges in terms of its equity and the quality of effective instructional practices in managing teaching and learning. The Bantu Education Act, 1953 (Act No. 47 of 1953; later renamed the Black Education Act, 1953) was a South African segregation law that legalized several aspects of the apartheid system. The Bantu Education system was abolished due to an absence of uniform leadership and management (Sinyosi, 2015). The abolishment of the Bantu Education system significantly restructured the patterns of instructional leadership in schools. Many schools were faced with the challenges of effectively implementing instructional leadership and managing it across various disciplines (Tshazibana, 2012).

Sinyosi (2015) propounds that the absence of uniform leadership and management in schools due to racial discrimination has led to the abolishment of Bantu Education in South Africa, leading to the introduction

of Outcomes-Based Education (OBE). Curriculum 2005, the National Curriculum Statement (NCS), and the Revised National Curriculum Statement (RNCS) formed the platform for transforming education from its apartheid past to the new democratic dispensation systems (National Senior Certificate [NCS], 2012; Tshabalala, 2015).

The implementation of the RNCS in the Further Education and Training (FET) band (Grade 10–12) resulted in the reconceptualization or review and redesign of all subjects offered in the FET phase to ensure that learners acquire the necessary knowledge, skills, and values in all disciplines. To address the teaching and learning challenges embodied in the RNCS, the Curriculum and Assessment Policy Statement (CAPS) was introduced in 2012. The National Curriculum Statement Grades R-12 gives expression to the knowledge, skills, and values worth learning in South African schools. This curriculum aims to ensure that SMTs and educators carry out instructional practices, and learners acquire and apply knowledge and skills in ways that are meaningful to their own lives (NCS, 2012).

Khoza (2012) maintains that the absence of instructional leadership at schools was still evident in all subjects in secondary schools. SMTs needed to understand how to conduct their instructional practices effectively and ensure a traditional approach as a point of departure in teaching (Jacobs et al., 2012; Mestry et al., 2013). Duff and McKinstry (2007) concur that a traditional method was used to teach accounting, but it was too narrow, procedural, and mechanical. As a result, educators were forced to rely on their own teaching and learning methods without understanding the nature and scope of instructional leadership in improving learners' performance. Rajoo (2012) consents that the teaching and learning of accounting were regarded as the art of recording transactions, making educators use the traditional approach to teaching accounting without adequate instructional guidance and directions. This implies that educators used their own teaching approaches in teaching accounting, due to the absence of instructional leadership.

In the accounting curriculum, new content was included, which was aimed to restructure the old and contemporary topics in the syllabus, and in new ways of facilitating learners' learning (Department of Education [DoE], 2008). This conceptualization had a direct bearing on teaching, learning, and assessment approaches, Learning Teaching and Support Materials (LTSM), accounting pedagogy and content, strategies in teaching accounting, and procedures that will aid successful teaching

and learning (Ngwenya, 2014). Based on the above literature, it can be said that changes in the content necessitated changes in approaches to instructional leadership. It follows; therefore, that understanding the influence of instructional leadership, management of teaching and learning, and the relationship between instructional leadership and learners' performance in a curriculum is necessary to ensure that schools achieve the educational goals of a country.

2.1 Research Problem and Objective

To buttress the points from the introduction and background, the Department of Basic Education (DBE) (2012) and NSC (2017) statistics have also identified the decline in the accounting pass rate. The student enrollment rate from 2016 to 2018 shows that some subjects (mathematics, accounting, and economics) have seen a decline in the number of students enrolling to write the NSC exams (NSC, 2017, 2018). There has been an 11 596 learner decline in accounting enrollment (DBE, 2019). Macupe (2020) and Hendriks and Dunn (2021) assert that the achievement of the half a million learners who wrote matric exams in 2020 is tempered by a decline in enrollment and pass rate of mathematics and accounting. The decline in learners' enrollment in accounting in South Africa is a clear motivation for the needed intervention to improve matric results and increase learners' enrollment in the accounting subject. This decline in the accounting pass rate can be traced back to the lack of understanding of SMTs' instructional leadership roles. Therefore, there is a need to investigate SMTs' perceptions of the influence of instructional leadership in enhancing accounting learners' performance. In attaining the aim of this study, the following research question was posed and demonstrated with the aid of a sequential explanatory mixed-method design: What are the SMTs' views on the nature and scope of the influence of instructional leadership in enhancing accounting learners' performance?

2.2 Research Paradigm

According to Creswell (2014), a research paradigm is the basic set of beliefs or worldviews that direct research. This means that the way we understand the world is directed by one's perceptions, beliefs, and knowledge. Paradigms are regarded as worldviews bringing together the totality

of the researchers' perceptions or choice of a study and the methods involved in conducting research (Kumar, 2014). A paradigm is also seen as a way of thinking about our world (Oates, 2008). It can be presumed that different researchers in a community of disciplines think differently about conducting research. As such, the chosen paradigm guides the researcher in solving the research problem. There are diverse kinds of paradigms, namely constructivism, post-positivism, interpretivism, critical research, objectivism, subjectivism, and pragmatism. Each of these paradigms looks at our world differently and solves research problems in a different manner. For the purpose of this study, a pragmatic paradigm in accordance with Creswell (2014) was adopted. It focused on the use of diverse research approaches in solving conceptual problems. The diverse research approach can be a combination of both qualitative and quantitative approaches to solving problems.

Pragmatists believe that reality is constantly renegotiated, debated, and interpreted; therefore, the best method to use is the one that solves the problem (Crotty, 2012). Kaushik and Walsh (2019) affirm that the pragmatic paradigm focuses on solving practical problems in the 'real world' by creating a solution to the problem investigated. This entails that the pragmatic paradigm allows the use of diverse research approaches, identifying problems through a follow-up of the research questions. Creswell and Clark (2011) indicated that in determining the possible solution that works in a pragmatic setting, the pragmatic paradigm uses the mixed-method research approach to gain quantitative and qualitative evidence for the study.

In addition, Creswell (2014) indicated that the pragmatist believes that research in a pragmatic setting is not committed to one system of reality, but by employing both quantitative and qualitative approaches to derive more knowledge about the problem. Since a pragmatic approach allows for problems to be constantly investigated, it can be deduced that the use of a pragmatic paradigm in this study will aid in identifying tenants of issues related to SMTs' perceptions of instructional leadership enhancing learners' performance.

A representation of the interconnection between the research paradigm, approach, design, and data collecting instruments used in this study is provided in Fig. 1, which illustrates how the choice of a research paradigm influenced the adoption of the research approach (mixed-methods research), the research design (explanatory sequential

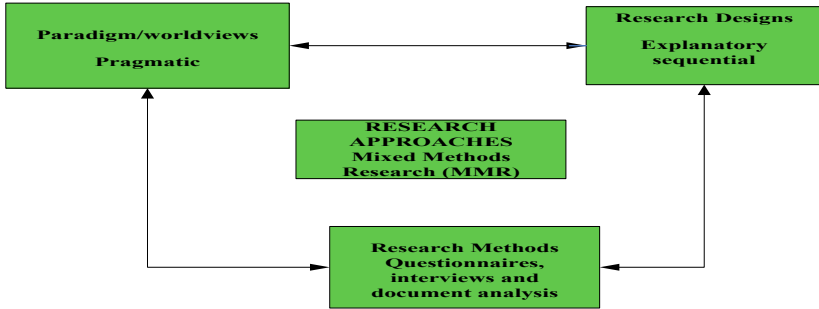


Fig. 1 The interconnections of paradigm, designs, and methods (Source Creswell [2014])

mixed-method design), and the data collection instruments (questionnaires and interviews). Figure 1 provides a breakdown and a road map for the research philosophy that underpins this study:

Drawing from Creswell (2014) and DeCuir-Gunby and Schutz (2016), the choice of a pragmatic paradigm aided the study in the following way: The pragmatic paradigm is problem-centered, and it is concerned with the fundamental conceptual question of this study, namely what are the SMTs' views on the nature and scope of the influence of instructional leadership in enhancing accounting learners' performance?

2.3 *Philosophical Assumption in the Pragmatic Research Paradigm*

A chosen paradigm in a study is embedded in the philosophical assumptions of a research method. According to Guba (2010), a research paradigm is associated with three core philosophical assumptions, namely ontological, epistemological and methodological assumptions. Painter-Morland (2015) indicates that a philosophical assumption is a theoretical framework used by researchers to collect, analyze, and interpret the data collected in a particular field of study. It can be said that the philosophical assumption establishes the background used for coming to conclusions or decisions based on the respondents' views and opinions in a study. Lincoln et al. (2011) assert that the philosophical assumptions in research shape how we see the reality of a research problem (the paradigm) and how we seek information to answer the research questions. This study adopted ontological and epistemological philosophical reasoning. Table 1 provides a comparison of the ontological and epistemological assumptions:

Table 1 Comparison of ontology and epistemological assumptions

<i>Ontology</i>	<i>Epistemology</i>
1. Nature of being/nature of the world	2. Grounds of knowledge
3. Reality	4. Relationship between reality and knowing what is
5. Relevance is abstract	6. Relevance is obvious
7. Shapes the way in which researchers see and study the research object	8. Helps to uncover knowledge of reality

Source Edirisingha (2012)

Ontology

The ontological assumption deals with the beliefs about the nature of being or reality or the truth and its context (Collins, 2010). Mack (2010) highlighted that the ontological assumptions are mostly based on the idealism and realism of the study. This study viewed ontology in a realistic setting. Creswell and Clark (2007) affirm that in a realistic setting, the reality is created within a given social or cultural context, so people can respond differently to the same phenomena. Enunciating realism in the study, the researchers had to assume that the world under investigation is a world populated by human beings (SMTs) who have their own thoughts, interpretations, and meanings of things happening around them. The researchers' investigation of this world is clearly manifested in the use of the different research approaches and techniques in order to investigate the perceptions of SMTs on the influence of instructional leadership in enhancing accounting learners' performance.

Epistemology

In order to learn about the realities and what formed the basis of knowledge in the phenomenon under investigation, there is a need to also review the epistemological assumptions of the study. According to Ritchie et al. (2013), epistemology is mainly used in qualitative studies concerned with ways of knowing and learning about the world and on issues, such as how we can learn about reality and what forms the basis of our knowledge. "Epistemology also looks at how one knows what is, the method of knowing the nature of reality or how one comes to know reality; assuming the relationship between the knower and the known" (Nieuwenhuis,

2007, p. 55). It then means that when making assumptions, it is important to ensure that the basis of knowledge is also processed; thus, having an in-depth knowledge on the ways instructional leadership and management influence accounting learners' performance. This was done through interviews with SMTs as they are instructional leaders and play diverse roles in ensuring that learner performance is adequately attained.

In achieving this epistemological assumption, the following approach was utilized: the researcher interacted closely with the SMTs through interviews to enable each participant to construct their perceptions of their instructional leadership practices and experiences in enhancing learners' performance. This enabled the researcher to understand how the participants identify the method of knowing the nature of reality or how the participants come to know the reality of how instructional leadership contributes to the performance of learners.

2.4 Research Approach

In social science research, the philosophical assumptions, paradigm, design, and methods constitute the research approach (Creswell, 2014). A mixed-methods research approach was adopted in this study, which constitutes both deductive and inductive reasoning. Since this study employed both quantitative and qualitative approaches, factors or constructs from the quantitative approach were further investigated in a qualitative phase as per the explanatory sequential design. The quantitative phase aided a follow-up investigation on the qualitative phase by reviewing the research question. The qualitative phase provided detailed findings as it produced an in-depth explanation of the findings made from the quantitative phase. It enabled the researchers to identify concepts and provide a detailed explanation of each construct as found in the quantitative phase, which aided in identifying the perceptions of SMTs on the influence of instructional leadership in enhancing learners' performance.

3 RESEARCH DESIGN

This study employed the explanatory sequential design. This design involves the collection and analysis of quantitative data followed by the collection and analysis of qualitative data (West, 2012). This design enabled the researcher to collect and analyze quantitative data in the first phase and then further provide a detailed understanding of the emergent

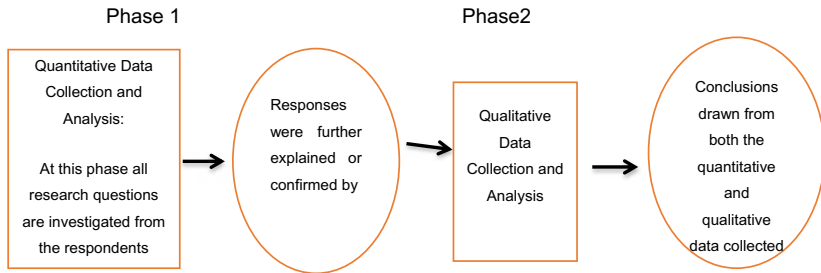


Fig. 2 Application of the explanatory sequential design in the study (*Source* Adapted from Creswell [2015])

items in the constructs from the quantitative phase through a qualitative research approach. Figure 2 explains how the explanatory sequential design was used in the study.

In applying explanatory sequential design to the study, the following fieldwork was carried out in each phase:

Phase 1 (Quantitative Phase)

Creswell and Plano Clark (2011) explain that the role of the quantitative phase in an explanatory sequential design is that it enables the researcher to provide a general picture of the research problem being investigated, with the aim of further explaining constructs in the next phase of the study. Following the aforementioned explanation, the first phase seeks to collect and analyze the quantitative trends. In the quantitative phase, a questionnaire was administered to the SMTs to obtain data on their perceptions of the nature, scope, and the relationship between instructional leadership and management of teaching and learning in enhancing accounting learners' performance. A questionnaire was used in this phase to attain the aim of the study (see section "[Sampling and Data Collection Technique](#)").

Phase 2 (Qualitative Phase)

According to West (2012), the results identified during the quantitative phase can be further investigated using a qualitative approach. In this phase, after a statistician has analyzed the quantitative data (in phase 1), an interview guide was used (in phase 2) to conduct interviews that

will further explain the constructs in the quantitative findings in detail. In-depth interviews were conducted with SMTs to explore areas identified and where little information exists in the quantitative findings. Bian (2016) also justifies that in explanatory sequential design, qualitative findings depend on the information identified in the quantitative results and can be followed up using themes from the research questions. It can be deduced that the further investigation of quantitative findings through a qualitative approach allows for more robust findings in seeking answers to the research questions. Creswell (2014) explains that the role of the qualitative findings in an explanatory design enables the researcher to further explain the items in a construct identified in the quantitative phase.

Therefore, this study carried out the sequential explanatory mixed-method design in the following order:

- The quantitative phase of the study identified SMTs perceptions of information relating to: (i) nature and scope of the relationship between instructional leadership; and (ii) learners' performance.

The qualitative investigation identified constructs from the quantitative phase and validated the construct with an in-depth interview which was analyzed with the aid of ATLAS.ti and presented in themes. These themes help to identify the exact response of the participants in relation to the questions asked by the researchers.

3.1 *Research Techniques and Procedures*

Population of the Study

The target population employed in this study comprised all accounting secondary schools in a district in the North-West Province. There are 61 accounting secondary schools in NMMDM, including parallel medium, dual medium, section 20 and 21 schools (NMMD, 2009).

The North-West Province of South Africa is divided into four district municipalities for local government purposes, which are divided into 18 local municipalities. These four districts include Ruth Mompati District, Bojanala Platinum District, Dr. Kenneth Kaunda District, and Ngaka Modiri Molema District (NMMD) (Statistic South Africa [Stats SA], 2016). NMMDM (formerly known as Central District) is also partitioned into five local municipalities, namely Mafikeng, Ratlou, Ditsobotla,

Table 2 Schools in NMMD

<i>Education facilities</i>	<i>Local municipality</i>					<i>NMMDM</i>
	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>Total</i>
	<i>MAFIKENG</i>	<i>RATLOU</i>	<i>RAMOTSHERE</i>	<i>DITSBOTLA</i>	<i>TSWAING</i>	
Total number of secondary schools	30	14	12	18	23	97
Number of accounting secondary schools	17	10	8	11	15	61
Number of non-accounting secondary schools	13	4	4	7	8	36

Source NMMDM (2014)

Ramotshere, and Tswaing (NMMDM, 2009). NMMDM was used because it has the largest number of public secondary schools that offer accounting; these schools are also in close proximity to the researchers. Table 2 provides information on the number of accounting secondary schools in NMMDM.

The Table 2 illustrates the total number of accounting and non-accounting secondary schools in NMMD. For the purpose of this study, the secondary schools teaching accounting in NMMD are the target population for the study. There are 17 secondary schools teaching accounting in Mafikeng, 10 in Ratlou, eight in Ramotshere, 11 in Ditsobotla, and 15 in Tswaing, which is represented as School A, B, C, D, and E in Table 2. Thus, a total of 61 public and private secondary schools were used as the target population for the study.

Sampling and Data Collection Technique

For the purpose of this study, a census or whole sampling technique was used to obtain data for the quantitative phase of the study. Creswell (2013) and Gentles et al. (2015) indicated that census sampling enables the researcher to use the whole set of a population that was identified for the study. All 61 secondary schools offering accounting in NMMDM were included in the study. In each school, the SMTs comprise the principal, deputy principal, and HoDs. As such, a total of 183 SMTs

participated in this study, and a four-point Likert scale questionnaire was used to collect data from the respondents for the quantitative phase of the study. This questionnaire enabled the participants to indicate whether they agree, strongly agree, disagree, or strongly disagree with each construct in the questionnaire. For schools with two deputies, the researcher only selected one deputy principal to participate in this study.

The researcher utilized a simple random sampling technique to select SMTs to be further interviewed in the qualitative phase of the study. A total number of 25 interviews were conducted. Individual face-to-face interviews were conducted for approximately 20 to 25 minutes per interviewee. The interview was conducted to provide further detailed evidence that the participants agree, strongly agree, disagree, or strongly disagree with the quantitative constructs of the study.

Data Analysis

Due to the interrelatedness of instructional leadership, management of teaching and learning, and learners' performance, a confirmatory factor analysis was utilized in this study. Following the confirmation of the reliability and validity of each scale, the study then presented the responses per factor through charts to ascertain the relationships between factors with the aid of correlation analysis. The study adopted the following benchmarks as suggested by Weinberg and Abramowitz (2016): a correlation coefficient between 0 and 0.3 indicates a weak correlation between the variables; a correlation coefficient between 0.3 and 0.5 indicates a moderate correlation between the variables; and a correlation coefficient of at least 0.5 indicates a strong correlation between the variables. A correlation close to zero suggests no linear association between two continuous variables. The correlation analysis enabled the researcher to identify the factors that need further investigation in the qualitative phase of the study.

During the qualitative phase of the data analysis, the researchers ensured that the emerging factors from the quantitative phase were further investigated through interviews. Once the qualitative data had been transcribed, data were organized, reviewed, and presented through a thematic analysis. In doing so, the researcher coded and presented the transcription into themes and categories using ATLAS.ti. This enabled the researcher to triangulate the interview responses to attain the explanatory sequential design utilized in this study.

4 RESEARCH EVIDENCE

Data collected pertaining to the views of SMTs on the nature and scope of the influence of instructional leadership in enhancing accounting learners’ performance was analyzed using Factor B9. Factor B9 constructs were further analyzed using items B9.2, B9.7, B9.9, and B9.10. Where B9.2 = Instructional leaders influence instructional change in schools through a collaborative effort with the accounting educators, B9.7 = instructional leadership is the duty of the principal along with other SMTs to manage resources and staff effectively. B9.9 = Instructional leaders require SMTs to mentor the educators to use learning aids to enhance learners learning and their performance. B9.10 = Instructional leaders should make classroom resources and learning aids available (e.g., maps, posters, chalkboard, pencils, notebooks, etc.).

The findings from Fig. 3 show that most of the respondents strongly agree on the nature and scope of the influence of instructional leadership in enhancing accounting learners’ performance. Item B9.2 shows that 77.2% strongly agree, while 22% agree; this shows that SMTs strongly agree that instructional leadership influences learner performance through a collaborative effort with the educators. Similarly, B9.9 shows that 50% strongly agree and 50% agree; this suggests that SMTs are of the view that the nature and scope of instructional leadership that influences learners’ performance, including mentoring educators to use learning aids to enhance learners’ performance, has an influence on learners’ performance.

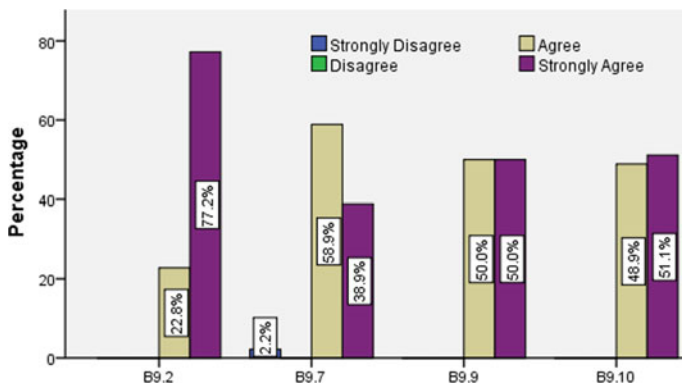


Fig. 3 SMTs view of the nature and scope of instructional leadership

Likewise, B9.10 shows that 51.1% strongly agree and 48.9% agree; this entails that SMTs strongly agree that the extent to which instructional leaders make classroom resources and learning aids available for classroom teaching and learning influences learners' performance. Item B9.7 also shows that 38.9% strongly agree, 58.9% agree, and 2.2% strongly disagree; this implies that SMTs strongly agree that instructional leadership is the responsibility of the principal and other SMTs to manage resources and staff, and effectively influence learners' performance.

Applying the explanatory sequential design, qualitative data were collected in the second phase of the study to validate and explain the constructs emerging from Factor B9, as reflected in items B9.2, B9.3, and B9.10. The following section presents the qualitative findings from SMTs with particular reference to Principals (P), Deputy Principals (DP), and HoDs' views on the nature and scope of the influence of instructional leadership in enhancing accounting learners' performance. The purpose was to highlight the specific perception of each SMT group concerning the nature and scope of instructional leadership and management of accounting education.

Figure 4 shows that principals believe SMTs' instructional leadership practices influence accounting learners' performance. This influence relates to providing instructions and interactions with educators and providing and developing adequate teaching materials. These views validate construct B9.2, where SMTs also strongly agree that instructional leadership influences educators, in turn affecting the leadership role of the educator and learners' performance. The principals' views further highlight that instructional leadership includes developing various roles that foster teaching and learning. This response further explains the emerging constructs from items B9.3 and B9.10, that instructional leadership influences learners' performance through providing support materials in teaching and effectively monitoring instructions to enhance learners' performance. The verbatim comments below are from the principals interviewed:

... It's about instructing, interacting with educators and developing relevant materials, routines and behaviour of educators and their ability to teach the learners, as they engage in activities that affect the growth of exposure directly. (P1)



Fig. 4 Principals’ views on the nature and scope of the influence of instructional leadership

...We make sure that there are enough resources. We make sure that we expose our teacher to new methods in terms of their duties. (P1)

...is about giving support to accounting educators, ensuring they got the required skills, identify their gaps. It is about leading the human resource element and providing the space of development. (P2)

Figure 5 presents the deputy principals’ views on the nature and scope of the influence of instructional leadership in enhancing accounting learners’ performance.

The deputy principals mentioned that instructional leadership influences learners’ performance by adequately managing school administration, instructing and directing educators, and offering awards to learners to foster effective learning. These responses further explained the emerging constructs from Item B9.2 that instructional leadership is about monitoring and instructing educators for a change in order to enhance learners’ performance. The verbatim comments below are from the deputy principals interviewed:

...instructional leadership influences learners’ performance through adequate instructions, motivate educators and monitoring. I personally play a part in the management and administration of the school. (DP2)

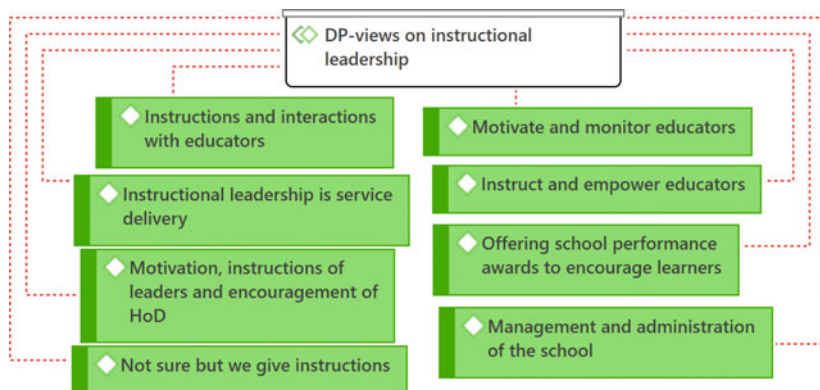


Fig. 5 Deputy principals' views of the nature and scope of instructional leadership

...We have school performance awards to encourage them; when they see these they perform well. (DP3)

...Yes, I know. I am an instructional leader. Actually, for our role to enhance performance, we have to instruct and empower the educators. (DP4)

The views of the HoDs as a member SMTs are summarized in Fig. 6:

Figure 6 shows that HoDs believe that the relationship's nature and scope on instructional leadership and learners' performance involves mentoring educators, influencing educators for any necessary change that may foster teaching and learning, and giving instructions to educators. Likewise, it also involves ensuring the availability of LTSM and interventions when duties are not performed. Undoubtedly, the HoDs are seen to be directly involved in the teaching and learning of accounting as they are expected to play more roles as an instructional leader. These responses further explained the emerging constructs from Item B9.7 that instructional leadership resides with the principal and other SMTs to effectively manage resources and staff. Similarly, B9.9 also shows that mentoring educators to use learning aids can enhance learners learning and their performance. Likewise, B9.10 states that classroom resources and learning aids foster learners' performance. The verbatim comments below are from the HoDs interviewed:

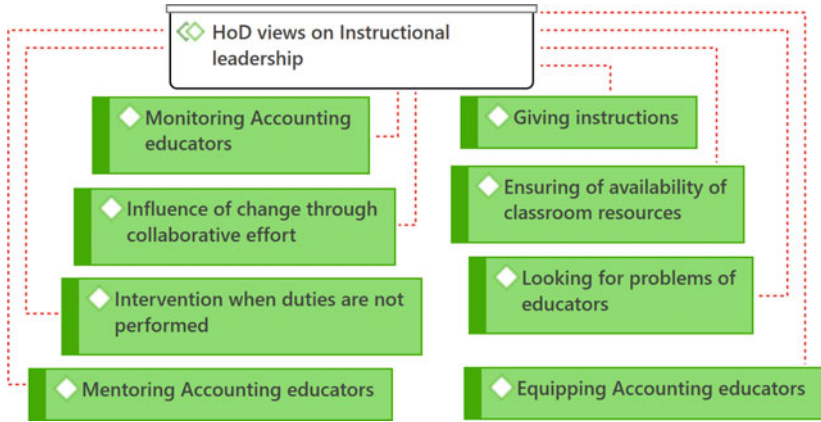


Fig. 6 HoDs views on the nature and scope of the influence of instructional leadership

...As a leader, I instruct accounting educators by guiding the teachers in my department. Unfortunately, I am working as HoD and accounting teacher; therefore, the workload is too much. (HoD 2)

...To ensure my instructional roles enhance learner’s performance, I scrutinise the work of the accounting educator by looking at their performance; some teachers have the knowledge but no methodology. (HoD 3)

...I also influence change in the school through a collaborative effort with the principals, deputy and accounting educators. (HoD 3)

The responses above show that HoDs felt that the nature and scope of instructional leadership is hampered by the workload faced (HoD2). This is so because, in some school, the HoD is also an accounting educator, therefore, creating more work for the HoD. Similarly, this study also found that the nature and scope of instructional leadership in enhancing learners’ performance is also influenced by the methodology utilized by an educator to teach accounting (HoD 3). This implies that although an educator might be knowledgeable on the content of accounting, the approach or methodology to transfer such knowledge to the learners remains a problem. Another aspect that may influence the performance of accounting learners also encompasses mentoring educators, influencing

educators for a change for any necessary change that may foster teaching and learning, giving instructions to educators, ensuring availability of LTSM, and interventions when duties are not performed.

The inference drawn from the findings of the SMTs above is that there may be a bit of uncertainty from the principals and deputy principals about whether SMTs understand how instructional leadership influences learners' performance. However, HoDs were able to understand how instructional leadership influences learners' performance and aspects that needs to be enhanced to ensure that the performance is well attained. In general, all SMTs must be well-trained on the nature and scope of instructional leadership in enhancing learner performance. NASSP (2018, p. 1) also emphasizes the need for SMTs as "head leaders" to work collaboratively to ensure change in learners' performance. This can be done through sound knowledge of instructional leadership and how each head leader is expected to carry out their roles at different levels of management. It goes a long way in implementing instructional leadership orientation and training on ways to enhance learners' performance (García-Martínez et al., 2018).

5 RESEARCH CONCLUSION

To answer the research question, what are the School Management Teams' views on the nature and scope of the influence of instructional leadership in enhancing accounting learners' performance? The study adopted the pragmatic setting which was committed to diverse system of reality by employing both quantitative and qualitative approaches to derive more knowledge. Based on the findings, SMTs perceptions of the influence of instructional leadership on accounting learners' performance are based on the ability to: instruct, understand the methodology in teaching accounting, develop relevant accounting materials, support educators, influence educators for change, and monitor and empower educators. This would also enable other SMTs to understand the aspect of instructional leadership that may enhance learners' performance in all subjects in schools.

6 CONCLUDING REMARKS ON THE RESEARCH PROCESS

The study yielded both quantitative and qualitative evidence of SMTs' views on the nature and scope of the influence of instructional leadership in enhancing accounting learners' performance. It was challenging to employ all 61 accounting secondary schools in NMMDM during the quantitative phase. However, the researchers ensured adequate time was allocated to collect the questionnaires and conduct interviews with the participants in these schools. As a result, the participants were all available to conduct the research and provide answers to the research problem under investigation. Furthermore, the data analysis was done by a professional analyst, which enabled the researchers to reach a conclusion for the study.

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Using Interpretive Phenomenology to Understand the Tax Compliance Lived Experiences of Small Business Owners

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1 INTRODUCTION

Small businesses play an important role in reducing unemployment and strengthening the economy. For this reason, many governments around the world implement tax reforms which favour small businesses (Kuzieva, 2017; Pope, 2008, p. 1). These favourable tax reforms are enacted to offset or reduce the burden associated with tax compliance. The South African Revenue Service (SARS) implemented small business desks throughout the country to service small businesses with a turnover of

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R20 million or less (DTC, 2016, p. 7). Other support initiatives by SARS include call centres, mobile tax units and an online appointment booking system for small businesses. Despite these initiatives, many small businesses are non-compliant with tax laws (Björklund, 2017; Morse et al., 2009).

The objective of the chapter is to illustrate how an interpretive phenomenological research approach can be used to understand the reasons behind the low tax compliance rates among small businesses. For this study, a phenomenological research approach is intended to reveal or discover the essence of the life experiences of small business owners regarding tax compliance. It is instrumental in examining and explaining experiences and perceptions of individuals about a phenomenon under investigation (Creswell, 2013; Patton, 2005; Tarakci et al., 2020). The sections that follow provide an overview of how a phenomenological research approach was applied in this study. Section 2 discusses the research problem and objectives, Sect. 3 deliberates on the research design. Section 4 provides snippets of the research evidence. The chapter ends with concluding remarks on the findings and the research process in Sects. 5 and 6, respectively.

2 RESEARCH PROBLEM AND OBJECTIVES

Small business owners contribute a fair share to the state tax gap (Björklund, 2017; Morse et al., 2009). The state tax gap is driven by non-compliance with tax laws and is often described as the difference between what taxpayers owe on real income and what they actually declare and pay to the receiver of revenue (Björklund, 2017; Morse et al., 2009). According to Morse et al. (2009), small business owners declare in aggregate less than 50% of their revenue.

Enforcing tax compliance among small businesses may be very challenging. The 2017/2018 SARS financial report showed that SARS completed 11 229 investigative audit cases for Small, Medium and Micro Enterprises (SMMEs) with a total yield of R8.3 billion. In comparison, 673 audits were completed for large business with a total yield of R5.5 billion (SARS, 2018). These equate to an average yield of R739 157 per audit for SMMEs and R8 172 362 per audit for large business. The high costs associated with enforcing tax compliance may discourage tax administrators to allocate resources to enforce tax compliance among small businesses. Tax statistics also show that of the 780 480 companies

assessed for the 2018 tax year as at 31 July 2020, only 170 207 (21.8%) represented Small Business Corporations (SBC)'s, generating corporate income tax amounting to only R2 590 million (1.3%) (SARS, 2020). The South African government may view this sector as unfulfilling and administratively difficult.

The main problem is that the rate of non-compliance among small businesses have been reported to be high (Kasipillai & Abdul-Jabbar, 2006). This is despite concerted efforts to simplify tax compliance for small businesses by revenue authorities across the globe. At the same time, enforcing tax compliance in this sector is tremendously expensive.

To solve the identified problem, the study sought to understand the reasons behind the low levels of compliance among small businesses. In addition, the study aims to investigate measures that SARS can put in place to encourage voluntary compliance among small businesses. The research design is discussed in the next section. In this section, the philosophical assumptions, the research approach as well as the data collection and analysis procedures are deliberated on.

3 RESEARCH DESIGN

The research design comprises the complete procedure of research, including the conceptualisation of a problem, research questions, data collection, data processing, interpretation, and report writing (Bogdan & Taylor, 1975; Creswell, 2007). Thus, the research design constitutes “the logical sequence that connects the empirical data to a study’s initial research questions and, ultimately, to its conclusions” (Yin, 2003, p. 20). The current section discusses the philosophical assumptions underpinning the study followed by the research approach, data collection and analysis processes.

3.1 *Philosophies*

Philosophical dimensions affect the practical application of the research by serving as a thinking framework that guides the behaviour of the researcher (Wahyuni, 2012). It is therefore important at the initial stages of the study to answer questions pertaining to the research paradigm that will be applied. Philosophical dimensions significantly impact how one carries out a social study from the way of framing and understanding social phenomena (Berry & Otley, 2004; Creswell, 2009; Neuman,

2011; Saunders et al., 2009; Wahyuni, 2012). A research paradigm is informed by two main philosophical assumptions, ontology and epistemology (Kalof et al., 2008; Laughlin, 1995; Saunders et al., 2009; Wahyuni, 2012).

Ontology: Subjectivism

The ontological stance adopted in the current study is subjectivism. Crotty (2003) explains ontology as the study of being. Ontology is concerned with the nature of social reality, it is the view of how one (the researchers, in this case, and the research participants) perceives reality (Patton, 2002). Ontology forces one to think about what kind of reality exists and can either be a single, verifiable reality or socially constructed multiple realities (Patton, 2002).

The subjective stance supports the underlying philosophical assumptions of interpretive phenomenology. Interpretive phenomenology is interested in revealing a contextual understanding of questions of meaning (Lewis, 2010, p. viii). The questions of meaning is dependent, in this case, on the experiences and perceptions of the small business owners who are social actors with their own personal views, understandings and meanings. Different individuals construct meaning in their own way, even as it pertains to one phenomenon (Crotty, 1996). Thus, social reality may change and can present several perspectives because of changes in perceptions and experiences (Hennink et al., 2011). One may argue that in the current setting, meanings are co-constructed by the researchers and the participants and not necessarily discovered.

Epistemology: Interpretivism

Epistemology is focused on the nature of knowledge and truth, it is concerned with ways of knowing as well as how knowledge is developed (Patton, 2002; Wahyuni, 2012). According to Wahyuni (2012), epistemology entails “the beliefs on the way to generate, understand and use the knowledge that are deemed to be acceptable and valid”. The epistemological stance answers the question of “What is the relationship between the researcher and that being researched?” (Creswell, 2007).

The epistemological stance adopted in this study is interpretivism. Interpretivism aims to empathically understand participants feelings, behaviour and the meaning they attach to daily lived experiences (Pulla & Carter, 2018). Interpretivist researchers prefer to interact and to have a discourse with the studied participants (Wahyuni, 2012). They also prefer

to work with qualitative data which provides rich descriptions of social constructs. The researchers chose to understand the social world from the experiences and subjective meanings that small business owners attach to it as opposed to generalisations or the nomothetic approach adopted by positivist researchers.

Interpretivism subscribes to constructivism (Wahyuni, 2012). According to Crotty (2003), social constructivism is defined as “the view that all knowledge and, therefore, all meaningful reality, is contingent upon human practices, being constructed in and out of the interaction between human beings and their world and, developed and transmitted within an essentially social context”.

Interpretivism is particularly suitable for a phenomenological research approach (Pulla & Carter, 2018). An interpretive phenomenological approach submits that the researchers cannot be separated from the world which they investigate and live in (Tuohy et al., 2013). Furthermore, interpretive phenomenologists argue that it is not possible for one to distance others from ‘being’, “the individual level of analysis can never be devoid of the social dimension that inhabits it” (Frechette et al., 2020, pp. 2–3).

3.2 *Research Approach*

The current study employed Heidegger’s interpretive phenomenological research approach. Interpretive phenomenology brings to the fore what may usually be taken for granted (Frechette et al., 2020). This approach aims to uncover the phenomenon by “pulling away layers of forgetfulness or hiddenness that are present in our everyday existence” (Frechette et al., 2020, p. 2). Interpretive phenomenology is interested in describing, understanding and interpreting participants’ experiences in order to determine the meaning of these experiences (Tuohy et al., 2013).

Dasein is one of the key doctrines of interpretive phenomenology (Tuohy et al., 2013). It means being there or man’s experience (Frechette et al., 2020). Thus, Heidegger’s philosophy acknowledges ‘being in the world’ (Flood, 2010). Dasein reinforces the understanding that researchers cannot be separated from the world which they live in (Flood, 2010; Tuohy et al., 2013). These lived experiences are thus affected by social, cultural and political settings (Flood, 2010; Tuohy et al., 2013). It is for this reason, that the researchers are encouraged to acknowledge and integrate the assumptions and preconceptions about the phenomena

under investigation into the research findings (McCance & McIlpatrick, 2008).

The previous knowledge constitutes an important guide to enquiry and help in ensuring that meanings are co-constructed by the researcher and the participants (Tuohy et al., 2013). Heidegger rejected Husserl's method of phenomenological reduction and his view of the transcendental ego (Cerbone, 2009; Dreyfus & Wrathall, 2007; Heidegger, 1927/2011; Horrigan-Kelly et al., 2016). Husserl believed that a scientific approach is indispensable when one is studying lived experiences of a group of people (Lopez & Willis, 2004). He argued that human experiences are valuable and should form part of scientific investigations (Lopez & Willis, 2004). Thus, to follow a scientific approach, Husserl advocated that the researcher must rid himself/herself of all previous knowledge to understand the essential lived experiences of the participants (Lopez & Willis, 2004).

Husserl's descriptive phenomenology is mainly concerned with the description of things as they appear to consciousness (Moran, 2000; Tuohy et al., 2013). Descriptive phenomenologists must be constantly aware of their previous knowledge and personal biases during the research process (Lopez & Willis, 2004; Natanson, 1973). In addition, they must ensure that the prior knowledge and biases are bracketed (Lopez & Willis, 2004; Natanson, 1973). Bracketing is an act of putting aside one's own beliefs and prior knowledge about the phenomenon under investigation (Carpenter, 2007). Interpretive phenomenology evolved from Husserl's descriptive phenomenology. Interpretive phenomenology does not require one to 'bracket' previous knowledge and stresses the notion that humans cannot remove themselves from the world they live in.

The researchers uncovered the tax compliance phenomenon, first by describing the lived experiences of the small business owners. This was achieved through telling a story of the participants lived experiences and providing the reader with an opportunity to visualise the experience as if they have lived it themselves. Thus, bringing the reader in close proximity of these experiences. The stories of the participants were told using a combination of direct quotes as well as the description of the essence of the lived world experiences.

Second, the researchers uncovered the tax compliance phenomenon by interpreting the meaning of the common experiences of the small business owners in the context of the existing body of knowledge. A lived experience account is not complete without interpreting its significance

(Frechette et al., 2020). The description combined with the interpretation of the lived experiences made it possible for the researchers to integrate their prior knowledge, assumptions, experiences and preconceptions about the tax compliance phenomenon into the research findings. The result of which was recommendations that will ultimately inform policy (National Treasury) and practice (SARS). In the context of this study, it is envisaged that the findings will enhance the understanding of the key factors that influence small business owners' tax compliance behaviour. The findings from the study will inform what measures ought to be put in place to improve voluntary compliance among small businesses.

3.3 *Data Collection*

The objective of the chapter is to illustrate how an interpretive phenomenological research approach can be used to understand the reasons behind the low tax compliance rates among small businesses. Collecting data for the purpose of an interpretive phenomenological approach requires one to be able to provide a platform for the participants to be open and willing to share their lived experiences. Secondly, the interview questions should be centred around the lived meaning of a human phenomenon where an experience can be recognised or accessed (van Manen, 2016, p. 297). Thirdly, the participants in a phenomenological study need to be cautiously selected to be persons who have experienced the phenomenon in question (Creswell, 2007). The current section is aimed at discussing the mode of communication, development of the interview questions and sampling techniques that are aligned to interpretive phenomenology.

Semi-Structured Interviews

Interviews permit the participants to tell a story of their lived experiences in a way that allows them to think about what is meaningful and worthy of sharing (Benner, 1994). Interpretive phenomenological approach encompasses the co-construction of meanings by the researchers and the participants. Thus, for the purpose of collecting data for an interpretive phenomenological approach interviews are typically unstructured or semi-structured with some pre-determined questions used as a guide (Benner, 1994). Semi-structured interviews, also referred to as non-standardised or qualitative interviews, comprise of structured in-depth interview questions (Saunders et al., 2009).

The researchers considered the use of semi-structured interviews appropriate because of the ability to use a list of pre-determined questions developed from themes emerging from a combination of the literature review and the conceptual framework. At the same time, one is able to take advantage of the flexibility that comes with in-depth qualitative interviews. Using a list of pre-determined questions, the researchers ensured that the same general areas of information are collected from each participant. Furthermore, the ability to adapt how each question is asked brought in the benefit of being able to take a flexible approach depending on the circumstances (Turner III, 2010). Keeping the questioning flexible facilitated the emergence of new information and where necessary, allowed the researchers to adapt to new directions (Rubin & Rubin, 2005).

Development of Interview Questions

The development of interview questions is a crucial component of the research approach. The interview questions should be centred around the lived meaning of a human phenomenon where an experience can be recognised or accessed (van Manen, 2016, p. 297). Participants' opinions, perceptions and beliefs are important as they often give access to the lived experiences that lie behind these opinions, perceptions or beliefs (van Manen, 2016, p. 300). Furthermore, phenomenological research ought to steer away from interview questions that are theoretical (van Manen, 2016, pp. 297–298).

The interview questions were drafted from themes arising from the literature review and the conceptual framework. Two measures were undertaken to determine if there were flaws, limitations or other weaknesses within the interview design which needed to be rectified prior to engaging with formal interviews. The two measures included a preliminary exploration (often referred to as a pilot study) as well as consultation with a qualitative expert. The preliminary exploration took place with three participants who had similar characteristics as those that participated in the implemented study.

Sample Selection and Size

A combination of purposive and snowball sampling techniques was employed. Phenomenological research approaches usually employ purposive sampling technique because it affords the researchers the opportunity to intentionally select participants who have rich knowledge about the

phenomenon under investigation (Polit & Beck, 2012). Furthermore, the participants in a phenomenological study need to be cautiously selected to be persons who have experienced the phenomenon in question (Creswell, 2007).

The target population for the study comprises small businesses in Gauteng with an annual revenue of up to R20 million. The R20 million threshold was derived from the Income Tax Act definition of an SME (ITA, 1962). Approximately, 35% of all SMMEs operate in the Gauteng province (SEDA, 2018). Thus, making it a province with the largest share of SMMEs out of the nine South African provinces.

The aim of a phenomenological study is to uncover the essence of a phenomenon and it is often not possible to determine the final sample size prior to the commencement of the field work (Chagadama, 2018). The initial aim was to interview 10 small business owners. According to Groenewald (2004), the sample sizes for interpretive phenomenological studies are usually small, with ten being the common size. Following the ten interviews, new meanings and rich data continued to emerge. As a result, the researchers extended the sample size to 25. At this point, it was evident that the researchers have gained a sufficient understanding of the tax compliance phenomenon. The researchers were able to demonstrate that no new meanings were emerging and that a point of saturation was reached. Furthermore, the researchers were satisfied that they were able to uncover the multiple layers of hiddenness of the tax compliance phenomenon within its context (Frechette et al., 2020).

The sample size compared well with previous phenomenological research. Mason (2010) analysed sample sizes of 25 phenomenological studies and found that the median sample size in these studies was 20. According to Haase (1987), a suitable sample size for a phenomenological study may range between six and ten participants. Seamark et al. (2004) interviewed ten participants in their phenomenological study which sought to explore the experiences of patients with severe chronic obstructive pulmonary disease. Adolfsson (2010) and Meyer (2016) engaged with 15 and 11 participants, respectively. Adolfsson (2010) explored women's miscarriage experiences and Meyer (2016) sought to understand patients' experiences of peripherally inserted central catheter deep vein thrombosis. Overko (2021) explored and described the lived experiences of career advancement of non-traditional minorities by enrolling six participants. Chagadama (2018) interviewed 20 participants aimed

at discovering the lived experience of health-related quality of life in ankylosing spondylitis.

3.4 *Data Analysis*

The researchers presented the phenomenological results thematically. Wherein the emerging themes were used as a generative guide to present the findings (Chagadama, 2018; van Manen, 1990). Ritruetchai et al. (2018) suggested four analytical steps to explore and gain a deeper and richer understanding of the meaning of the lived experience of the participants. The steps include:

- uncovering thematic aspects;
- isolating thematic statements;
- composing linguistic transformations, and
- gleaning thematic descriptions.

These steps were slightly customised to also consider some of the coding recommendations offered by Saldaña (2013). According to Adams and van Manen (2017), phenomenological research is never a prescribed procedural or step-by-step form of inquiry. Instead, the methods employed need to correspond with the phenomena under investigation. Each of these steps are briefly described below.

Uncovering Thematic Aspects

Uncovering thematic aspects entails the process of preparing the interview transcripts to ensure they are accurate and ready for the next step of the analysis process (Ritruetchai et al., 2018). In addition, it is a process wherein the researchers engage with, and reflect on the text (Ritruetchai et al., 2018). Upon the receipt of the transcripts, the researchers checked the accuracy of the transcripts by listening to the digital audio files while at the same time reading the transcripts. The process of listening to the digital audio files repeatedly afforded the researchers the opportunity to re-live the interview encounter and reflect on what the participants were saying during the interviews. The preparation of the transcripts further allowed the researchers the ability to familiarise themselves with the data and initiate the analysis process.

Isolating Thematic Statements

Isolating thematic statements entails a process whereby the researchers repeatedly read the transcripts and reflect on the text. During this process five levels (rounds) of coding emerged, namely: (i) holistic coding, (ii) separating the data into manageable parts, (iii) highlighting significant statements, (iv) assigning codes to the significant statements (line-by-line coding) and (v) assigning codes to a paragraph containing a significant statement. The formal coding process commenced while the data collection process was still underway. Commencing with coding while the data collection was underway opened more scope for more prompts and exploration in the interviews that followed.

Codes may be created from theory (theory-driven), existing literature, research goals (structural) or data (data driven) (DeCuir-Gunby et al., 2011, pp. 137–138). For this study, an inductive approach to coding was followed. The majority of the codes were data driven. The aim was to elevate the voice of the business owners by allowing the primary data to speak for itself. To kick-start the coding, the researchers selected two transcripts. Below is a summary of the process followed to code the selected two transcripts:

The first round of coding entailed a process whereby the researchers read the transcript with the intention to capture the fundamental meaning of the transcript as a whole. The fundamental meaning was captured in the form of a ‘holistic’ code documented in the form of a memo using ATLAS.ti software. Holistic coding is a process whereby a single code is allocated to a large unit of data to capture the meaning of the overall contents (Saldaña, 2013).

The second round of coding involved breaking down the transcripts into manageable parts (Saldaña, 2013, p. 17). Long passages of data were broken into short paragraph length units with a line break in between soon as the topic seems to change. During the third round of coding, the researchers underlined or highlighted the significant statements (Saldaña, 2013, p. 19).

The fourth round of coding comprised of a reflection of the significant statements to decipher its core meaning and to determine an appropriate code for each. The researchers opted to assign a code to a portion of data representing the significant statement, which varied in size from one sentence to a couple of sentences. The coding process followed in this regard is referred to in the literature as line-by-line coding or the

splitting method (Saldaña, 2013). The key advantage of following line-by-line coding is that, because the codes are assigned at the level of a significant statement, one can examine the data with more care. Charmaz (2008, p. 94) argues that line-by-line coding encourages a more reliable analysis that “reduces the likelihood of imputing your motives, fears, or unresolved personal issues to your respondents and to your collected data”.

The line-by-line coding resulted in an overwhelming number of data points (quotations) as each significant statement represented a data point. The line-by-line coding exercise was considered important by the researchers, especially for the first few transcripts at the beginning of the process. Coding is exploratory and a cyclical act. It is unusual for coding to be perfectly carried out in the first cycle, the second and third cycles are instrumental in grasping meaning and managing the salient features of the data (Saldaña, 2013, p. 8).

The researchers found that coding at the sentence level was not meaningful as the sentence often lacked context. For this reason, a fifth round of coding ensued. The researchers revisited the two transcripts, this time with the aim of assigning a code to a paragraph instead of a sentence, thus moving away from line-by-line coding and moving towards lumping (taking large excerpt of data and assigning to it a code). The process of assigning codes to a paragraph instead of a sentence meant that each datum contained multiple codes, also referred to as simultaneous coding. According to Saldaña (2013, p. 80), simultaneous coding constitutes “the application of two or more different codes to a single qualitative datum, or the overlapped occurrence of two or more codes applied to sequential units of qualitative data”.

The five rounds of coding the two transcripts resulted in a preliminary code book that was then used to code the remainder of the 23 transcripts. The preliminary code book was constantly updated to integrate new codes that emerged from the remaining 23 transcripts. The coding of the 23 transcripts followed the same steps outlined above. Furthermore, the researchers replaced line-by-line coding with lumping for the remainder of 23 transcripts.

Prior to moving on to composing linguistic transformations and gleaning thematic descriptions, the researchers revisited the code book in order to streamline the identified codes. Some of the codes were renamed, combined with other codes or deleted altogether. Attention was placed on codes which were less grounded (less than five data points) in order to

determine whether it is necessary to keep these codes. The above coding process resulted in 161 codes and 1 063 data points.

The next section elaborates on the last two steps of the analysis process. That is, ‘composing linguistic transformations’ and ‘gleaning thematic descriptions’.

Composing Linguistic Transformations and Gleaning Thematic Descriptions

The key objective of ‘composing linguistic transformations’ and ‘gleaning thematic descriptions’ was to develop themes from the first cycle codes. This was done through an ongoing dialogue and engagement with first cycle codes. During this process of developing themes, the first cycle codes were first reorganised and reconfigured to generate a list of categories. The researcher made use of pre-fixes to group the codes which carried a similar idea into categories. Each category represented a number of codes. The categories were classified in accordance with the underlying meaning of the experiences. The categories represented codes that are clustered together according to similarity.

A number of categories were thereafter grouped together to form sub-themes. The sub-themes represented the middle order themes, which helped organise categories which carried with them a comparable meaning. The naming conventions of the categories and the sub-themes were descriptive in nature as they were very close to the data. The sub-themes were then brought together to form the themes. This process required the researchers to be fully immersed with the data to be able to make decisions regarding which codes may be grouped together. The composing linguistic transformations and gleaning thematic descriptions coding process described above resulted in seven themes that are described in the following section.

4 RESEARCH EVIDENCE

The coding process resulted in seven themes, with each theme summarised below.

<i>Themes</i>	<i>Summary of the theme</i>
<p>Theme 1: Lack of basic tax knowledge leads to unintended tax non-compliance. Small business owners cannot be compliant all by themselves</p>	<p>The evidence suggests that small business owners lack the basic knowledge to be compliant by themselves. SARS have different initiatives where they teach taxpayers of their tax compliance responsibilities. These initiatives include among others, workshops, webinars and the website. The small business owners are however not aware of these initiatives</p>
<p>Theme 2: Small business owners are entitled to excellent service, irrespective of the method of engagement with SARS</p>	<p>Concerns were raised about SARS consultants who are not knowledgeable about their own products, lacked communication skills and displayed poor customer service. Poor service delivery carries with it negative financial implications as taxpayers may lose out on opportunities while still waiting for their tax matters to be resolved</p>
<p>Theme 3: Small business owners are compelled to outsource tax related functions</p>	<p>Small business owners outsource tax compliance functions as they are compelled to do so. Tax is a specialised skill. Whereas many of the business owners may be knowledgeable about their specific trade, the subject of tax may still be foreign and intimidating to them. More so because mistakes can be costly. Inability by SARS to be able to offer seamless and efficient services induce some business owners to outsource. Thus, running away from the inconvenience of having to que for a long period at branches. Wait for weeks for appointments. Hold for too long at call centres. Or meted with unfriendly or sometimes not so knowledgeable consultants. Small business owners would rather focus on what they are good at and leave the rest to tax professionals</p>

(continued)

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<i>Themes</i>	<i>Summary of the theme</i>
Theme 4: The VAT agency principle is a myth	VAT eats away from the profits of these businesses. Small businesses are usually constrained by external factors when it comes to pricing of their goods and services. Additionally, small business owners are not always paid on time. And that place a lot of strain on these businesses because they either must incur penalties or borrow money to pay SARS
Theme 5: Small business owners' tax morale is impacted negatively by the selective way SARS enforces compliance	The participants raised concerns regarding the selective way SARS enforces compliance. Many of the participants argued that SARS' enforcement measures are geared towards the taxpayers who are already trying to comply. Those who have not bothered registering for taxes are not pursued. Several participants made a special mention of informal traders, arguing that SARS is not doing enough to ensure that they comply
Theme 6: At the heart of equity in taxation is the guiding principle of fairness which has to a large extent not been upheld by the current tax system	The participants acknowledged the need to collect tax revenues and agreed that the tax system is fair from that perspective. In addition, the small business owners mentioned that the tax system is fair because of some of the tax breaks that are available to them. It would appear, however, that some of the small business owners are not aware of these tax breaks. The exclusion of certain businesses from qualifying for the tax breaks made those small business owners to perceive the tax system to be unfair towards them
Theme 7: Small business owners comply to the extent that there are some direct or indirect benefits towards their businesses	The small business owners need a reason to comply, they need to be incentivised. The incentives do not necessarily have to be monetary benefits and include peace of mind and legitimacy. Some of the other incentives linked to compliance include the ability or opportunity to do business with the state and other private corporations

5 RESEARCH CONCLUSION

Overall, the evidence suggests that small business owners lack the basic knowledge to be compliant by themselves. Furthermore, small business owners still rely heavily on the branch network, for example, many of them still prefer to visit a SARS branch instead of using the online platforms. This is due to, among others, lack of infrastructure, a lack of basic tax knowledge and the reality that many small business owners may not be familiar with technology. The evidence further suggests that the most effective form of enforcement is when the requirement to comply come from suppliers, customers, lenders, employees and so forth. This is because it becomes difficult to trade without a tax compliance certificate.

6 CONCLUDING REMARKS ON THE RESEARCH PROCESS

The study lays a foundation and provide practical guidance on how to apply interpretive phenomenological research approach in accounting sciences environment. Interpretive phenomenology is a delicate research approach and one should try and stay true to its doctrines. The sampling process ought to be undertaken in such a way that only participants who have experienced the phenomenon under consideration are selected. During the interviews, responsive interviewing must be employed to facilitate the open sharing of the participants' experiences without the researcher influencing the direction of the responses. The voices of the participants must be emphasised to reveal the essence of the life experiences of the small business owners. Highlighting participants' voices give the readers an opportunity to understand these experiences even though they may not have lived that experience themselves.

Taxation is a highly sensitive matter, and potential participants may decline to participate for fear of punishment. For this reason, it was difficult to recruit participants who were willing to share their lived experiences for fear that the information may be leaked to the tax authorities. This was especially the case for small businesses that are not registered for taxes. Thus, the study comprised mainly of those small businesses that are already trying to comply. Nonetheless, because of their interaction with the existing tax system, their experiences led to an understanding of the reasons that may be responsible for low compliance rates among small businesses.

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Utilising an In-Depth Qualitative Approach in a Non-western Context: Exploring the Demands and Resources of First-Year Students from the Perspectives of Support Structures at a Peri-Urban University Campus

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1 INTRODUCTION

South African higher education institutions (HEIs) face many challenges, including concerns about high dropout rates, slow throughput rates and poor student success (Fourie, 2020; van Zyl et al., 2020). Many students enrolling at universities in South Africa are first-generation students (i.e., students first in their families to attend university), coming from socio-economic contexts of deprivation (Department of Higher Education &

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Training, 2018). In a developing country such as South Africa, many students are concerned about meeting their basic needs, including access to food, accommodation, safety and transport—all aspects which potentially impede and negatively affect their studies at university (van Zyl et al., 2020).

Compared to high school learners, first-year students experience additional demands and stressors linked with university life (Fincham & Kagee, 2015). Students often underestimate the expectations placed on them by the university and do not realise the psychological impact of failing to cope with these demands, including dealing with interpersonal, emotional and financial problems (McKenna & Boughey, 2016). As a result, students may lose hope and feel they have even fewer resources to deal with the high study demands from the unfamiliar contexts of the universities they attend (Reeve et al., 2013; Salanova et al., 2010).

South African first-year students face a range of challenging factors, including language barriers, improper scholastic preparation for university, socioeconomic disadvantage and poverty (De Villiers, 2014; Lewin & Mawoyo, 2014). Also, more and more university students report high levels of psychological distress (e.g., anxiety, exhaustion, overwhelm and depression) with low levels of mental well-being and resilience (Eckersley, 2011; van Agteren et al., 2019). This is especially true among first-year students at higher risk for stress-related illnesses (Friedlander et al., 2007; Geng & Midford, 2015). Thus, first-year students' mental health and well-being are particularly concerning for researchers and practitioners alike.

Investigating the numerous factors that could impact student well-being is complicated since so many factors could play a role in explaining student well-being (van der Zanden et al., 2018). As a result, the body of research on student well-being focuses on isolated aspects, is often fragmented and lacks an integrated approach focusing on both negative (pathogenic) and positive (salutogenic) well-being processes. One contributing factor to this situation is the lack of a valid scientific theoretical model to incorporate the intricate and dynamic processes underlying student well-being, specifically in higher education.

Several models and frameworks of well-being in different disciplines were reviewed to guide research on student well-being. For this study, the most widely applied, empirically tested and leading approach in well-being research in occupational health psychology was chosen, namely the Job Demands-Resources (JD-R) model (Bakker & Demerouti, 2017).

2 THEORETICAL UNDERPINNINGS

The JD-R model categorises demands and resources within workplace settings that interact and influence employee well-being and outcomes through independent, interrelated interactions and processes (Bakker & Demerouti, 2017). Two core assumptions of the model are crucial to consider for the current study.

- All characteristics influencing employees' well-being can be classified into two broad categories: job demands and job resources. Bakker and Demerouti define job demands as "*those physical, psychological, social, or organizational aspects of the job that require sustained physical and/or psychological effort and are therefore associated with certain physiological and/or psychological costs*" (e.g., extremely high workload, emotionally taxing interactions). Job resources refer to "*those physical, psychological, social, or organizational aspects of the job that are functional in achieving work goals, reduce job demands and the associated physiological and psychological costs, or stimulate personal growth, learning, and development*" (e.g., social support, opportunities to learn and grow) (2017, p. 274).
- The JD-R model integrates the negative and positive underlying well-being processes, health impairment and motivational processes. The health impairment process occurs when job demands are consistently present, leading to strain (e.g., exhaustion, anxiety, psychological health complaints) and associated adverse outcomes (e.g., intention to leave). On the other hand, the motivational process occurs when resources buffer the effect of high demands and enable high motivation, keeping employees engaged and committed, leading to positive outcomes such as high job performance.

The JD-R model has great potential to be applied to the student and the university context to understand student well-being holistically. Therefore, it is vital to explore the contextual variables that could potentially influence first-year students' well-being, utilising the assumptions of the JD-R model. However, limited studies are available investigating and exploring ways the JD-R could be applied in university contexts in South Africa. Specifically, there is a need for qualitative understanding that could explain first-year students' experiences of study demands and resources (Botha et al., 2019; Greeff et al., 2021). Qualitative research is uniquely

positioned to explore and understand subjective experiences and is a well-established, rigorous methodological approach (Creswell & Poth, 2018; Denzin & Lincoln, 2018). Also, the quality of how a qualitative study is designed and conducted dramatically impacts the quality of the findings of a study (Morse, 2018; Tracy, 2010).

3 AIMS AND OBJECTIVES

This chapter aims to provide practical strategies and examples to guide emerging researchers in conducting an in-depth qualitative study in a non-Western context. The chapter outlines the core tactics that could be followed when conducting a qualitative study, followed by an *illustration* of each strategy from a published qualitative study (Manaka, 2019). The published study aimed to explore the demands and resources components of the JD-R model. It was an in-depth qualitative study on the insights and perspectives of staff members and service providers (i.e., support structures) working with first-year students studying at a peri-urban¹ South African university.

The chapter follows four distinct sections that illustrate what comprises conducting a qualitative, in-depth study. Section one entails planning the research, including designing and preparing for conducting an in-depth qualitative research study. Section two considers executing the research to illustrate relevant data collection and fieldwork strategies, while section three involves data analysis and reporting of the results. Disseminating the findings through practical research outputs for stakeholders follows in section four. Finally, the chapter concludes with a summary, limitations and recommendations.

4 PRACTICAL INSIGHTS ON CONDUCTING QUALITATIVE RESEARCH

The following sections provide insight into the practical considerations, practices and actions that produce high-quality qualitative research. Planning, executing, conducting and disseminating research are vital components of the research process (Hossain, 2011). Although there

¹ Peri-urban refers to an urban area with a surrounding rural area (Merriam-Webster Dictionary, 2022).

is consensus to conduct quality research using rigour and trustworthiness, there are multiple ways of enabling and applying these principles (Krefting, 1991; Morse, 2018; Tracy, 2020). The following sections integrate the strategies of multiple authors to provide practical guidance in conducting qualitative research with supportive examples.

4.1 *Planning Research: Designing and Preparing an In-Depth Qualitative Research Study*

During the planning phase, the following should be considered: choosing a worthy topic, formulating a convincing argument for the importance of the study through reviewing the literature and identifying the gaps in the literature that the proposed research will address, formulating central research questions and objectives, choosing an appropriate research design and methodology and getting the appropriate permissions and ethical clearance for conducting the study to explore a particular phenomenon under investigation.

Choosing a Worthy Topic

A research topic should be relevant, timely, significant and interesting (Tracy, 2010). In the example study, the worthiness of the topic was demonstrated by emphasising the growing concern about psychological distress and the well-being of students at HEIs (Cobo-Rendón et al., 2020; Luescher et al., 2018).

Illustration: More and more studies report that students experience high levels of psychological distress, exhaustion, anxiety, overwhelm and depression with low levels of mental well-being and resilience (Eckersley, 2011; van Agteren et al., 2019). The concern is especially prevalent among first-year students at higher risk for stress-related illnesses (Friedlander et al., 2007; Geng & Midford, 2015). The implication is that more South African students are experiencing depression and suicide ideation than reported for other population groups in South Africa and the world (Bantjes et al., 2016). Accordingly, there is a pressing need to explore and understand the topic in greater depth, especially to understand how first-year students experience study demands and resources that influence their well-being outcomes.

Formulating a Convincing Argument for the Importance of the Study: The Literature Review and Identifying Gaps that Should Be Addressed

It is essential to emphasise the importance of a study through a proper literature review to identify potential gaps and formulate a convincing argument (Flick, 2018a). The contribution should be significant and can contribute conceptually, theoretically, practically, morally, methodologically or heuristically (Tracy, 2010, 2020).

Illustration: Four main gaps were highlighted that emphasise the importance and value of the study, arguing how the study can contribute to the current body of the literature.

- Few studies exist that systematically and empirically investigate, explore and explain first-year students' well-being with its complexities within non-Western countries, including South Africa (Makhubela, 2021).
- There is an absence of a valid and reliable theoretical model that integrate the dynamic student well-being processes (Kulikowski et al., 2019; Lesener et al., 2020). To address the gap, some researchers apply the JD-R model of Bakker and Demerouti (2017) within HEI settings (Lesener et al., 2020; Salanova et al., 2010). However, most of these studies use a quantitative design. They include a limited scope and understanding of study demands and resources, showing the need to explore the broad range of demands and resources that students experience—enabled through a qualitative design.
- Many of the well-being measures used in South African research studies are generated from Western contexts (Henrich et al., 2010). Such measures may be less applicable for non-Western contexts that are diverse, multi-ethnic² (Verkuyten, 2004) and predominantly align with a collectivistic cultural orientation³ (Blokland, 2016). As a result, researchers and practitioners in South Africa are urging a deeper understanding of the contributing factors to university students' psychological well-being (Pretorius & Blaauw, 2020).
- Many studies solely rely on students' self-reports. Gathering insights from other appropriate perspectives, such as support structures working with first-year students, could provide additional insights into the unique experiences of students' demands and resources (Patton, 2015; Speckman & Mandew, 2014).

*Formulating a Central Research Question or Objective(s)
for the Phenomenon Under Investigation*

A research study is generally designed around a central research objective to answer a central phenomenon under investigation (Agee, 2009) and should be stated in such a way that it answers: Why, what, when, where and how (Creswell & Creswell, 2018; Patton, 2015). For each approach, the research question one chooses impacts the research design. The question(s) should be carefully formulated to align and fit with the research problem and design.

Illustration: There is a call for rigorous qualitative exploration of the JD-R model, and in particular, a need to explore, understand and explain first-year students' experiences of demands and resources in a non-Western country such as South Africa. This study aimed to 1) conduct an in-depth qualitative study on the demands and resources components of the JD-R model and 2) explore the insights and perspectives of staff and service providers who engage with first-year students at a South African peri-urban campus.

Choosing a Research Design and Methodology

The importance of choosing the appropriate research design is well-documented (Creswell & Creswell, 2018; Creswell & Poth, 2018). How and why questions are answered through qualitative research to unpack and understand explanations within a particular, naturalistic setting (Flick, 2018b). The selected research design should align the research questions, how it will be implemented and how useful the data will be (Maxwell, 2013). Such considerations include deciding on the research paradigm, which impacts data collection and analysis and ways of interpreting and disseminating data ethically (Mertens, 2012, 2018; Tracy, 2020).

² The term ethnicity refers to a specific group's cultural characteristics and can include norms, values, attitudes and typical behaviours.

³ Where people define their identity in terms of tribal and ethnolinguistic affiliations.

Illustration: An interpretive philosophy was selected to access participants' socially constructed, diverse and subjective experiences (Thorne, 2016). An interpretive, descriptive approach allows researchers to access explanations and understandings from participants' worlds, which are embedded in their diverse and complex experiences (Creswell & Poth, 2018). An inductive approach drew information closer to participants' experiences and contexts (Patton, 2015). A qualitative research methodology strategically accessed phenomenological informed descriptions and interpretations (Tracy, 2020). It was well suited to provide evidence-based results in a specific context (i.e., first-year students' adjustment experiences to university life) from a specific perspective (i.e., university structures—detailed in Sect. 4.2).

Institutional Permission and Ethical Clearance

Ethical research principles are central to conducting high-quality qualitative research with integrity. It should consider, among others, procedural ethics (such as including human participants in the research), situational and culturally specific ethics, relational ethics and exiting ethics (leaving the scene and sharing the research) (Tracy, 2010).

There are several types of ethics to adhere to, including the institutional application processes and regulatory bodies within the country of the application. Specific research settings and contexts may require additional permissions and detailing potential relational dynamics that could influence the research process and how just and sound practices will be ensured. From entering the research environment up to exiting and providing a detailed plan on how the findings will be presented and disseminated, should be included in the application and the overall research plan (Chilisa & Phatshwane, 2022; Iphofen & Tolich, 2018; Mertens, 2018).

Scientific and ethics committees will review and approve the content and processes outlined in a research proposal. Equally important to the necessary permissions is conducting fieldwork with integrity throughout the research process and applying ethical principles in practice. Therefore, ethical aspects and rigour in research are not merely an activity engaged through data collection and analysis but integrated through the entire research process (Mertens, 2018; Tracy, 2020).

Illustration: Appropriate scientific and ethics committees approved the current research (ethics number: NWU-HS-2014–0165). Participation was voluntary, and withdrawal carried no negative consequence. In addition to the administrative applications and approval to conduct the study, the researchers considered best practices in conducting high-quality qualitative research through eight criteria described by Tracy (2010). The criteria include selecting a worthy topic, conducting research with rich rigour, being sincere and credible, having resonance, making a significant contribution and conducting ethical research with meaningful coherence (Tracy, 2010, p. 840). In applying the criteria, the researchers facilitated good conduct through trustworthiness, ensuring research integrity from conceptualisation to completion and dissemination of the research.

4.2 *Executing Research: Data Collection and Fieldwork*

This section includes research procedures such as negotiating access, relying on gatekeepers to facilitate access, describing research contexts (for participants and the setting where the study was located) and conducting data collection through suitable methods that initiate meaningful, culturally appropriate conversations. Appropriate data collection includes language and cultural diversity considerations, equipment tools, fieldwork training and sincerity. Finally, practically setting up research questions that align with the research phenomenon being studied within a particular timeframe is illustrated.

Research Procedure: Negotiating Access to and Relying on a Trusted Gatekeeper

Gatekeepers are individuals or organisations that facilitate (or limit) access to potential participants in adherence to inherent principles and practices within a particular setting (Singh & Wassenaar, 2016). As such, relying on gatekeepers is increasingly common to ensure mutually respectful and beneficial agreements between researchers and participants that promote research integrity.

Illustration: The gatekeeper reviewed the research approach, methods, research question and probes and provided practical insights into adjusting

or tweaking information that would be considered culturally appropriate (Mertens et al., 2013). The gatekeeper also facilitated access to participants who could best provide information to answer the research question. Using purposive, voluntary and snowball sampling (Patton, 2015), the gatekeeper facilitated the selection of a range of participants. Potential participants included academic- and support staff from various departments at the university. The selection included persons who support, work with or provide services to first-year students. The gatekeeper provided the contact information of possible participants. Researchers sent emails on research ethics, recruitment invitations and referral requests. Besides recruiting participants through emails, in-person referrals were followed up to meet potential participants in-person.

Describing the Participants and Context of the Study

In qualitative research, providing detailed descriptions of participants and the study context is essential for other researchers to consider the potential transferability of the findings to their settings and participants (Denzin & Lincoln, 2018; Patton, 2015; Tracy, 2020). Participant and context information should provide enough detail for potential comparison across similar contexts. Such details could include demographics (including age, gender, education, employment or work experience, socioeconomic status, language preferences and marital status), psychographics (including lifestyle, attitudes and opinions) and nuanced information related to the particular study (Merriam & Tisdell, 2016). In addition, the purpose and value of descriptive, contextual information are to understand participants and their experiences better and provide meaningful insight into participants' contexts (Tracy, 2020).

Illustration: In total, sixteen participants participated, including staff members, i.e., lecturers ($n = 3$), an administration officer ($n = 1$), finance officers ($n = 2$), residence officers ($n = 2$), a sports manager ($n = 1$), and counselling services ($n = 1$); as well as senior students who included a peer mentor and student-instructor ($n = 1$) and dedicated orientation services from the student council ($n = 5$). Their experience in working with, supporting or providing services to first-year students ranged from 1 to 21 years. The sample included two Caucasian participants (Afrikaans

and English-speaking), and most participants were African, i.e., fourteen (Setswana, $n = 10$; SiSwati, $n = 2$; Oshimwambo, $n = 1$; and English, $n = 1$). The participants were representative of the HEI cultural and language demographics, which is essential to access multiple perspectives to ensure rigour (Krefting, 1991; Tracy, 2020).

Additional context information was included from national statistics to describe the regional demographics that impact the environment in which the participants and first-year university students are embedded.⁴ Such descriptions included geographic isolation from structural and human resources and community descriptors that capture the environments where participants (and the first-year students they reported on) live and work (Bot et al., 2000; Msila, 2010; The Gaffney Group, 2011a, 2011b).

Conducting Interviews: Initiate Meaningful Conversations that Are Culturally Appropriate

Nearly, all qualitative data collection methods include an interview aspect as part of the methodology (DiCicco-Bloom & Crabtree, 2006; Merriam & Tisdell, 2016; Patton, 2015). While qualitative research is based on “the assumption that it will bring voice to the marginalized” (2022, p. 225), the reality remains that much of how data are collected is influenced by non-Western discourses and practices (Chilisa & Phatshwane, 2022). Researchers in Africa increasingly call for indigenous non-Western data collection (Chilisa, 2012; Mertens et al., 2013). It is, therefore, essential to use culturally appropriate data collection methods.

Illustration: Data were collected through culturally appropriate relational in-depth interviews (Chilisa, 2012) using in-person or video-conferencing and lasted between 30–90 minutes. Relational interviews⁵ allowed the interviewer to engage collaboratively in the conversation through an indigenous worldview that “lean[s] toward communities’ togetherness, cooperation, and connectedness” (Chilisa, 2012, p. 204), i.e., socially constructed experiences. These interviews focused on connecting people, places and contexts with each other through meaningful, in-depth conversations. The interviewer used a central question with an interview guide

⁴ An expanded version is published elsewhere (*cf.* Manaka, 2019; Mostert et al., 2022).

to facilitate discussions and explain terminology from academic disciplines that participants may be less familiar with to clarify and introduce topics for conversations with participants—appropriate with the selected indigenous technique. Examples of the questions and interview guide are detailed in Sect. 4.2.7.

Language and Cultural Considerations

Working in multicultural settings requires being prepared for multilingual participants whose language of preference may differ and the practical implications for conducting research with interpretation and translation (Shimpuku & Norr, 2012; Welch & Piekari, 2006).

Illustration: Two bilingual researchers conducted the interviews in three of the official languages of the university, i.e., English, Setswana and Afrikaans. At the same time, participants were encouraged to communicate in their language of preference for translation at a later stage.

Equipment, Tools, and Training

Preparation for fieldwork includes preparing research materials, training in particular methods and developing the discipline required to sustain intense research processes on multiple levels, including mental, physical, psychological and intellectual (Patton, 2002). It is especially important to know “how to prepare your body and soul for research uncertainties, seek consent and build relationships with participants” (Tracy, 2020, p. 105), including time spent in the field conducting research. The practices noted below were adapted from Patton (2002, 2015) and Tracy (2020).

Illustration: The researchers trained and worked with a fieldworker with experience in in-field interpretation. The researchers and the fieldworker prepared using the research question, probes and theoretical constructs to ensure they understood and read into the investigation topic before data

⁵ Also called “Focused Life-Story Interviews” (Chilisa, 2012: 208).

collection. Before entering the field, the researchers and the fieldworker practised using the recording tools and equipment (both in-person and via teleconference). They ensured backup batteries, stable Wi-Fi and access to a secure, private space to conduct the interviews. Data were audio-recorded, transcribed and translated at a later stage.

Sincerity

Tracy (2010) explains that sincerity should include self-reflexivity about subjective values, biases and inclinations of the researcher(s) and transparency about the methods and challenges researchers face. Such reflexive behaviours are embedded within socially constructed realities and researchers' understandings of how they experience and potentially impact the data gathered and analysed to present participants' authentic experiences as closely as possible (Patton, 2015).

Illustration: Researchers kept meticulous notes (through researcher memos and field notes), debriefed after each data collection opportunity (audio-recorded), noting the impact of the session, what stood out, what they wanted to know more of for potential follow-up and so forth (Patton, 2002; Tracy, 2020). Researchers also mapped locations on a campus map and surrounding areas referenced and took short videos and photos to capture participants' descriptions outside of interviews that provided additional context information. Researchers' reflexivity included what worked well, potential hindrances or pitfalls, biases or opinions, thus making their inner thoughts visible and enhancing in-field practices for further data collection and analysis. The transparency of reflexivity enhanced the sincerity of the research.

Setting up Strategic Research Questions that Align with Answering the Phenomenon Being Studied

Qualitative research questions can be designed in two ways. Either entering the research field to explore and develop questions as the research continues (i.e., not limiting the topic and instead naturally noticing potential questions); or devising specific questions to navigate potentially unfamiliar research contexts to orient the research (Tracy, 2020). Simultaneously, research questions are developed in the context

of theoretical frameworks where researchers recognise that they inevitably enter the research process with “a head full of theories and concepts” (Tracy, 2020, p. 317). Therefore, articulating the research question within a specific theoretical framework facilitates developing the research question(s) and objective(s) to explore the phenomena under investigation (Tracy, 2020).

Illustration: The current study used a central focus to understand *how* participants working with first-year students at the specific peri-urban HEI explained students’ well-being when starting university—specifically students’ resources, demands and outcomes on their studies. The researchers used the central focus within the context of two specific theories aligned with the study’s core focus. This meant including the JD-R theory (Bakker & Demerouti, 2017) to inform the study demands and resources components of the study; and the general systems theory or ecological model (Bronfenbrenner & Morris, 2006; Von Bertalanffy, 1972) that situates participants within their university environment. The schematic presentation in Fig. 1 was used to visualise the theoretical components of the study, train the researchers for fieldwork and provide a tangible guide during data collection.

In-depth interviews’ content may deviate from the focus of the research since participants’ life stories may follow various topics outside the focus of the particular research study (Tracy, 2020). Using in-depth relational interviews, researchers could introduce particular areas of interest to the research aligned with the natural flow of the conversation (Chilisa, 2012), thus generating qualitative data for a particular purpose (Maxwell, 2013).

Illustration: The central research question was: “Tell me about your experiences *in working with first-year students at this university*”. The researchers included three strategic focus areas for the in-depth relational interviews. Figure 2 depicts the organisation of the foci: Study demands (or stressors), study resources and the context of participants’ explanations of how they engaged with first-year students. The visualisation allowed the researchers to navigate and encourage the flow of conversations from multiple angles. Note that the probes for each focus were not followed in any particular order and were only used to ensure the flow and depth of conversations.

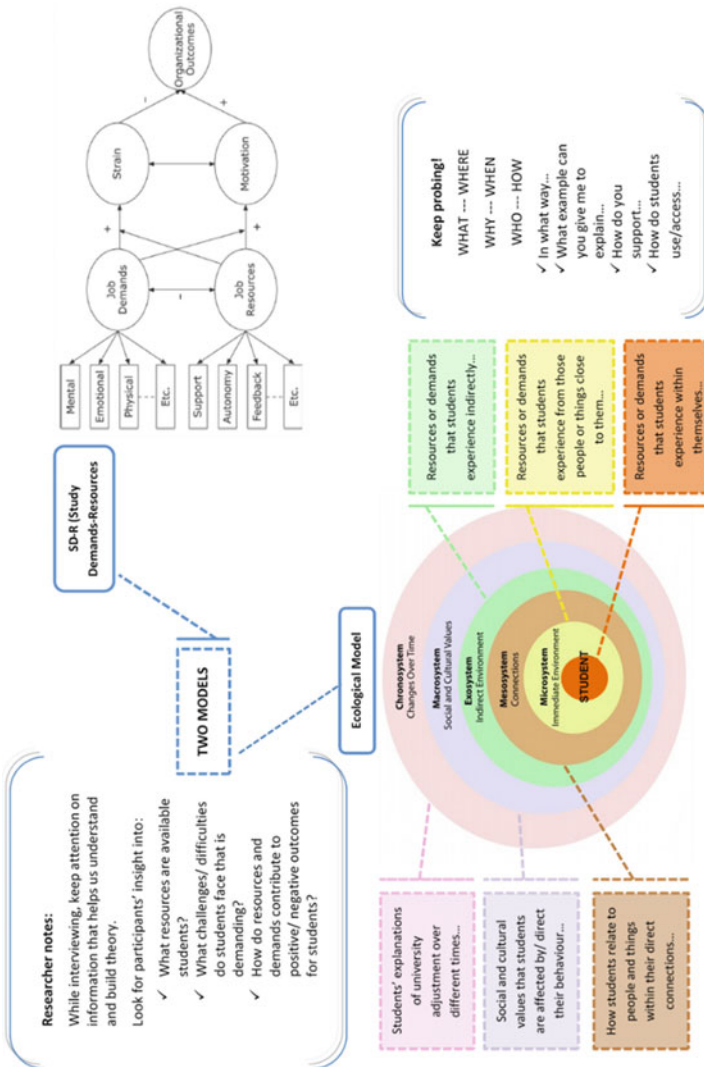


Fig. 1 Schematic presentation of theories and concepts to consider and keep in mind for the in-depth relational interview held with structures from the HEI

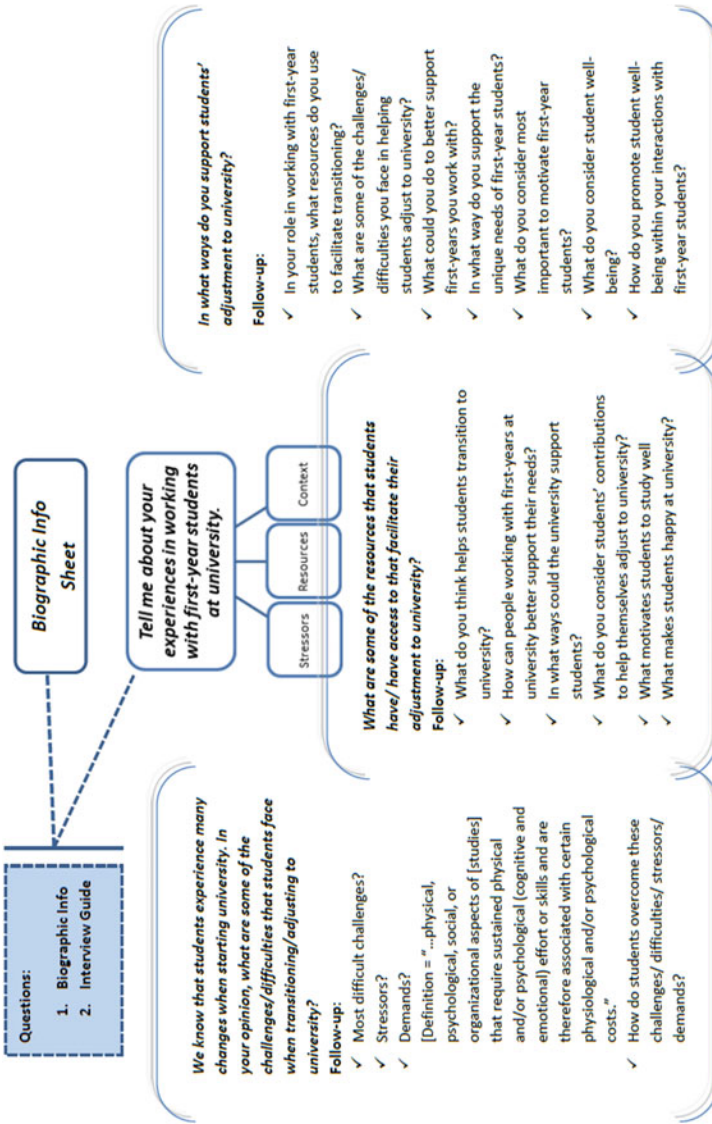


Fig. 2 Diagram depicting the central research question to elicit in-depth relational conversations on first-year study demands

Setting up a Timeline for Conducting Fieldwork

Setting up the timeline for conducting fieldwork included ensuring a spacious schedule to meet participants and conduct the interviews over a prolonged period to prevent fatigue and allow the researchers to review previous data collected before starting the subsequent interviews (Patton, 2015).

Illustration: Researchers prepared for data collection by piloting questions, negotiating access, and engaging with the gatekeeper for two months, arranged interviews over three months, and follow-up visits and continued communication with participants following over another six months spread across a year. Practically, this meant that researchers engaged with participants at multiple contact points during preparation for data collection, building rapport, scheduling and conducting data collection and doing member reflections with participants once data were analysed (Patton, 2015).

4.3 Conducting Analysis: Data Analysis and Reporting the Results

Data analysis is an activity that starts when choosing a data collection method since the analysis is determined by the type of data collected and influenced by the actual data generated (Creswell & Poth, 2018; Saldaña, 2016; Tracy, 2020). At the same time, data analysis also considers the end in mind—applying the analysis and configuring how to reach and accurately report the outcome (Friese, 2019; Woolf & Silver, 2018).

Data Analysis

Choosing and setting up data management systems includes, but is not limited to, planning for transcribing, preparing scripts for analysis, choosing to use analysis tools or manual systems, storage and access to data and methods for data collection and analysis (Patton, 2015; Tracy, 2020). In order to ensure credibility, research analysis should be marked by thick descriptions, concrete detail, explication of tacit (non-textual) knowledge, and showing rather than telling, triangulation or crystallisation, multivocality and member reflections (see Tracy, 2010, p. 840).

Illustration: Findings were triangulated by comparing and contrasting evidence from within and across participants' explanations, field notes and researcher memos. Through detailed descriptions of participants' contexts, experiences and conditions, the researchers offer accurate reflections of participants' views as closely to the data as possible. Analyses included independent and researcher consensus and member reflections on clarifying and expanding understandings and were published from multiple vantage points to corroborate and triangulate the information accurately (*cf.* Patton, 2015; Tracy, 2020).

Two independent co-coders⁶ analysed the data separately using primary and secondary coding cycles (Creswell & Poth, 2018; Saldaña, 2016; Tracy, 2020). Immersing into the data, the co-coders read the data transcripts, followed by independent open coding (Saldaña, 2016). After the first coding cycle, the co-coders met to review the independent analysis. Notes were made on similarities and differences, followed by consensus discussions. On review, the co-coders merged similar codes and developed a system to rename codes to organise codes for ease and consistency of applying the codes for the remainder of the data analysis (Friese, 2017, 2019).

Next, the co-coders began second cycle coding to conceptually group similar codes (Miles et al., 2014). Codes were organised into code groups, establishing code-code relationships with the groupings and memos and analysis tools from ATLAS.ti version 8 (i.e., code co-occurrence explorer, code-document table and query tool to interrogate emerging patterns) (Friese, 2019; Woolf & Silver, 2018). Using code networks, the final themes were drawn up and critically reviewed. Using ATLAS.ti provided a tangible audit trail to ensure rigour and trustworthiness (Friese, 2019; Woolf & Silver, 2018).

Results: Synthesise and Find Insights

Quality qualitative findings should reflect participants' experiences accurately while distilling the information meaningfully (Saldaña, 2016; Tracy, 2020). Results should be embedded in the original data and are interpreted at the hand of extant literature while showcasing contributions (Tracy, 2020). Some highlights of the published study are provided here

⁶ Manaka and Kahl conducted the initial coding, followed by consensus discussions. All analyses were reviewed by Mostert. Integrated consensus discussions were grounded in the data in ATLAS.ti version 8.

to illustrate the value of generating findings from indigenous methodologies (Chilisa, 2012).

Illustration: Five distinct themes were developed from the thematic interpretations: (i) the complex lives of first-year students; (ii) the nature of the academic environment; (iii) the economic experiences of studying; (iv) accommodation and facilities; and (v) the transition to university life (adjustments and expectations).

The themes noted above contributed to the nuanced understanding of the demands and resources components of the JD-R model. Results illustrated how first-year students reportedly experienced academic demands as pressure (Demetriou et al., 2017; Pather et al., 2017). Beyond that, their experiences were complicated with complex interactions where academic, political, social and cultural aspects intersect. As such, transitioning to university was experienced as a culture shock (Azmitia et al., 2013), in which the university's individualistic-oriented structure did not match students' collectivistic cultural values. The findings were illustrated through supportive structures that recognised and facilitated first-year students' access to insufficient (or lack of) resources to support them. The findings provided tangible examples of culturally meaningful activities and relations experienced as resourceful within a diverse, peri-urban campus.

4.4 Disseminating Findings: Practical Research Outputs and Share Results with Stakeholders

Two crucial aspects to consider in disseminating research results are resonance and meaningful coherence as part of conducting high-quality qualitative research (Tracy, 2010). These criteria are expressed by Tracy (2010, p. 840), where resonance refers to how the research influences and moves particular readers or a variety of audiences through aesthetic, evocative representations, naturalistic generalisations and transferable findings. Furthermore, meaningful coherence refers to a study that achieved what it set out to do, used methods and procedures that fit its stated goals, and meaningfully interconnects literature, research questions or foci, findings and interpretations.

Illustration: Practitioners need to understand student well-being holistically and within a greater framework of how demands and resources interact, are facilitated, and impact study outcomes for first-year students. Such insights could help first-year students discern the challenges they face to approach appropriate resources to help them adjust to university and promote well-being on various levels (academically, psychologically, pragmatically and socially). The current study challenges mainstream responses to encourage in-depth, empirically informed decisions. Practitioners' responses should understand and promote multi-level, complex interactions of study demands and resources that foster first-year students' well-being amidst diverse, culturally embedded contexts. As such, practitioners can mobilise institutional resource provision and access and promote and strengthen first-year students' personal resources. Thus, the current study could resonate and be of value to structures working with first-year students at similar HEIs or within the context of first-year study demands and resources. Though the researchers understand the limitations of small-scale qualitative studies, the findings could be transferable to similar contexts, and participants since natural generalisations are embedded within and across descriptions of experiences (Denzin & Lincoln, 2018; Tracy, 2020).

In terms of coherence, the current study contained logic and consistency in achieving what it set out to inform through nuanced results that added to the understanding of first-year students' demands and resources. Thus, the results related to what was intended to achieve with the research.

Data dissemination provides feedback and valuable platforms to communicate findings and generates practical applications that inform future research directions while amplifying the value of participants' insights when exiting the research setting (Singh & Wassenaar, 2016; Tracy, 2020).

Illustration: Since meaningful coherence is established compared to extant literature and practices, the researchers opted to disseminate findings through publications, presenting findings to stakeholders and participants through practical workshops or colloquiums, and publishing the results in an accredited academic journal. These publications, presentations and workshops provide an opportunity to gain feedback, scrutinise the integrity

of the findings and align findings and interpretations with existing theorists, expanding on the work of scholars and practitioners known for their contributions in a particular field and gain meaningful feedback.

The findings were disseminated in the following ways:

- A published mini-dissertation fulfilling the requirements for the degree *Master of Commerce in Industrial Psychology* at the North-West University: Exploring first-year students' experiences of the demands and resources at a rural-based university delivery site (Manaka, 2019).
- A conference paper was presented at the 5th Annual South African National Resource Centre for the First-Year Experiences Conference. Durban, South Africa (Manaka et al., 2019).
- An academic research paper was published in an international journal (Mostert et al., 2023).
- Practical workshops were presented to the support structures of the participating university, including stakeholders from student counselling and academic development services.

5 CONCLUSION

This chapter aimed to provide practical steps and examples from a published empirical study to guide emerging researchers in conducting an in-depth qualitative study in a non-Western context. Four sections were outlined to facilitate the understanding of conducting an in-depth qualitative study, including (1) planning, designing and preparing for the research; (2) executing the study, including data collection and field-work; (3) data analyses and reporting of results and (4) disseminating the findings of a study through practical research outputs for stakeholders. Each strategy was illustrated with practical examples from a published in-depth qualitative study. The published study focused on exploring the demands and resources that first-year students at a peri-urban university in South Africa experience. The illustrations showcase indigenous, in-depth interviews to gain insights and perspectives of staff members and service providers (i.e., support structures) working with first-year students. Applying qualitative research using the strategies and practical examples from an in-depth qualitative study can support emerging qualitative researchers to bridge the gap between theoretical principles and the practical application thereof. Such strategies and practical examples could guide researchers and practitioners working in non-Western settings using appropriate qualitative indigenous methods.

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The Legitimacy Predicament of Current-Day Accounting Theory

Pieter W. Buys 

1 BACKGROUND

The volatility, complexity, and ambiguity in the modern business environment present unique challenges for contemporary organizations. Among these are concerns regarding effective resource utilization, stakeholder requirements, and regulatory reporting. Furthermore, the accounting profession's reputation often comes under fire due to international corporate failures and corruption (Parker, 2007). It may be argued that since accounting translates an organization's performance into financial terms, accounting theory should embrace practical accounting realities. However, as a scientific discipline, accounting (theory) should be founded on principles of scientific rigor and not merely be focused on technical skill and application. Hence the objective of this study, which was to critically reflect on the legitimacy of foundational accounting concepts in (1)

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the context of the contemporary business environment and (2) what is promulgated as accounting theory.

Even though accounting has many specialization areas, the two primary foci areas are internally orientated managerial accounting and externally orientated financial accounting (Drury, 2018; Horngren et al., 2015). Within these two foci areas, financial accounting is subject to rules (i.e., financial standards and regulations), which guide how financial information is to be determined and disclosed. This research study focused on financial accounting, particularly on certain foundational aspects that may influence its application in the contemporary business environment.

In context, this chapter's primary aim is to elucidate *critical reflection* as a research methodology in accounting and share some of the experiences in conducting such research. Nevertheless, this will not be possible without discussing various aspects of the actual research and related conclusions.

2 PERSPECTIVES ON ACCOUNTING

Considering the global developments in accounting over the past decade or two, there appears to be a problem of a lack of legitimacy in fronting business information generated by accounting. The prevalence of the importance of rule applications, a focus on financial performances, and the (perhaps short-sighted) reporting thereof are arguably responsible for the limited perception of its crucial societal role. In the context of the study's objective of reflecting on the (epistemological) aspects related to legitimacy concerns about accounting theory, this study reflected on certain foundational elements of accounting, including the following:

- Even though professional accountants must adhere to codes of ethical and professional conduct, the advent of fraud and corruption may arguably be seen as an attack on the historical stewardship function of accounting (Williams, 2009), raising the issue of what *actual* ethical accounting conduct requires.
- Even though the various iterations of the conceptual accounting framework aim to inform accounting practice and, to some extent, certain information user classes, it arguably seems to be more focused on meeting the accounting regulators' requirements (Fellingham, 2007), raising the question of what the primary foundational *objective* of accounting is.

- Even though the financial statements form the basis for communicating financial information (Palepu et al., 2007), the ability to approximate the values presented in the financial statements is typically the barometer of accounting methods' efficacy, raising the issue of what *actual value* is, at any given time, let alone how to measure it.
- Even though the objective of decision-usefulness is a common criterion to guide accounting research and support the formulation of corporate policies and strategies (Williams, 2009), considering the many corporate failures and fraudulent events, one cannot but wonder how trustworthy the financial information is in supporting decisions.

Taking cognizance of the above, the chapter firstly focuses on the study's research problem as the basis for the methodology selection before explaining the research design that follows. Finally, the research evidence and conclusions per the original study are also included to provide overall context.

3 RESEARCH PROBLEM AND OBJECTIVES

If philosophy is considered as the underlying principle for a particular discipline (Livingstone, 2008) and the rational inquiry into its principles (Blackbury, 1994), one may argue that a philosophical reflection on the legitimacy of accounting theory is overdue (Demski, 2007; Fellingham, 2007). The reality of contemporary accounting is a somewhat unique situation where practice and industry requirements significantly influence how its academic side is approached.

Because of this industry impact on the *science* of accounting, the research study's primary aim was to reflect on the legitimacy (or validity) of accounting assumptions, concepts, and objectives as promulgated by accounting regulators. In consideration hereof, certain meta-theoretical assumptions formed the basis of the study. Firstly, accounting is seen as (1) a method to gauge the organization's performance measurement, (2) aiming to reflect reality, and (3) as having predictive abilities. Secondly, the accounting information is representative of actual (resource) quantities and monetary values in the organization's context.

In support of the above primary research aim, several secondary research objectives in addressing the primary purpose were identified, as follows:

- Consideration of ethics in the practice of accounting.
- Consideration of a definitive accounting philosophy that embraces aspects such as accountability, integrity, and reliability.
- Consideration of the value concept in accounting from qualitative and quantitative perspectives.
- Consideration of the decision-usefulness concept to classify the purpose of accounting.

4 RESEARCH DESIGN

4.1 A Reflective Approach to Accounting Research

As mentioned above, the study was reflective in nature. As such philosophical discussion and reasoning take center stage, as opposed to empirical data collection, analysis, and validation. In this context, the *Three Worlds Framework* per Mouton (2011) and Van der Schyf (2008) are used to contextualize the study and elucidate differences between research approaches. This framework classifies research levels as follows:

- i. Lay knowledge required in ordinary tasks or *pragmatic* interest can be found in the *World I* domain.
- ii. Research that converts the above lay knowledge into objects of inquiry or *epistemic* interest is found in the *World II* domain.
- iii. Reflections on the motives and validations of specific actions or *critical* interest are found in the *World III* domain.

According to Mouton (2011), the latter domain (i.e., critical interest) includes multiple meta-disciplines, including that of scientific philosophy and methodology (Mouton, 2011). It is also generally accepted that scientific findings cannot irrefutably be demonstrated based on empirical research alone and that many (scientific) theories are often justified based on assumptions in the critical (or meta-theoretical) sphere (Mouton & Marais, 2009), including the research's underlying paradigms and models. This study, therefore, embraced a philosophical analysis of *accounting's*

meta-science, per the research objective, and aims to lessen the constriction between the epistemic and pragmatic views of accounting.

4.2 *Paradigm Perspectives*

According to Lewis (2001) and Hazelrigg (1986), philosophical ontology denotes the study of reality or existence, which in turn can be categorized as either (1) objectivism, which argues that reality exists autonomous from consciousness (Hazelrigg, 1986; Henning et al., 2009; Lewis, 2001) and (2) constructivism, which argues that personal experiences are fundamental in constructing perceptions of the reality (Hazelrigg, 1986; Ladyman, 2002; Lewis, 2001). In the context of this study, the ontological view leaned toward constructivism and accepted possible misconstructions between the *perceived* function of accounting and the *reality* thereof in the contemporary business environment.

Furthermore, Mouton and Marais (2009) view the concept of a research paradigm as the principal model embraced when conducting scientific research. Conventional accounting research is arguably framed in a positivistic paradigm, with perhaps some aspects of interpretivism thrown in. According to Audi (2005), Blackburny (1994), and Rahi (2017) positivism embraces empirical inquiry as the singular source of essential knowledge. This implies that deductive reasoning is employed to postulate accounting theories. Interpretivism expands somewhat on positivism in that it aims to understand the research results in each context (Carson et al., 2009; Nieuwenhuis, 2020). Therefore, for research that seeks to understand the conduct of various role players, such as found in the complicated environment in which accounting finds itself, interpretivism may be appropriate to explore the complex reality effectually.

As an alternative to positivism (among others), a critical paradigm approach aims to deconstruct the reality under scrutiny (Henning et al., 2009; Kekeya, 2019; Probert, 1999). Carlsson (2006) opines that a robust research approach encourages the critical realization that reality will be understood only by identifying the structures that cause specific actions and the discourses therein. Therefore, although positivism and interpretivism are very much applicable in an accounting context, the integrated nature of accounting with business and social environments does imply that critical, reflective research can also significantly enrich accounting's claim as a social (business) science.

Henning et al. (2009) opine that qualitative paradigm researchers will typically apply approaches that are rooted in either:

- Philosophy that reflects on questions the constructions and crux of reality, known as *phenomenology*.
- Sociology enquiries into how to make sense of daily activities, known as *ethnomethodology*.
- Social psychology enquires about the environmental elements that cause specific actions and the subjective meaning attached to such details, known as *symbolic interactionism*.
- Theology, philosophy, and literary criticism that considers the conditions under which a human activity took place, known as *hermeneutics*.

At first glance, the above approaches may seem to be radically different. However, Mouton and Marais (2009) argue that in the context of social sciences research, there is plenty of opportunity for overlap between these approaches. A reflection on the legitimacy of contemporary accounting can thus be approached in any (or a combination) of these approaches.

4.3 *Research Approach*

The applied research approach comprised a combination of a literature overview and critical reflection. Firstly, the literature overview provided the foundation for understanding contemporary accounting theory, including frameworks, financial reporting, decision support, and performance management. Secondly, in its reflective endeavors to consider contemporary accounting theory's legitimacy, the research was positioned principally within the critical framework. To a certain extent, however, interpretive facets were included to enrich the discussions. Also, seeing that the study drew on accounting phenomena, including ethics, value concepts, and related factors, the research approach was primarily centered on phenomenology and hermeneutics. In this context, the research approach's justification is found in its challenging conventional accounting assumptions and perceptions.

The critical reflection also endeavored to evaluate accounting's ideas and beliefs, autonomous of conventional research experiences. As such,

the foci were on foundational questions about logical explanations rather than the experimental research and concepts.

5 RESEARCH EVIDENCE

Considering the lacunae regarding the legitimacy of accounting theory, the study aimed to recognize key accounting facets that may contribute to the discussion at hand. These facets include critical ethical issues, the foundational building blocks, the concept of value, and the decision-usefulness objective—all within the context of accounting theory and practices.

5.1 *Ethical Considerations*

Accountancy was historically understood as fulfilling a stewardship function. Even though the current objective(s) of accounting arguably may be seen as downplaying stewardship, it remains essential. Ethical conduct in an accounting context is encouraged by the various accounting institutes' requirement of observance of *professional conduct codes*. These codes are typically based on the following pillars:

- **Competency** requires adequate accounting-related technical skills.
- **Integrity** requires honesty and determination.
- **Objectivity** requires professional impartiality and detachment.
- **Confidentiality** requires refraining from disclosing and misuse of professionally acquired information.

Professional conduct can be defined as how a person dedicated to their profession acts. However, even though the accountant should avoid damaging the profession's reputation, ethical behavior further affects the accountant and other related stakeholders. It might, therefore, seem that the pillars mentioned above address the ethics issues in accountancy. However, when reflecting hereon, there are two sides to the coin. On the one hand, there is the aspect of doing *the right because of the rules*, i.e., the adherence to the codes of conduct. On the other hand, there is the aspect of doing *the right thing because it is the right thing*, i.e., a moral element. The latter can never be codified. Therefore, although

professional codes of conduct aim to guide ethical behavior, the human condition will always be prone to temptation to the contrary.

Furthermore, of the typical four pillars of professional conduct, only the *integrity* aspect considers the human condition. In the context of the prevalence of corruption and ethical failures, the absence of integrity is arguably the primary contributor to letdowns in other areas of professional conduct. Historically, personal belief systems and family values played a significant role in professional conduct in any field. However, in contemporary and secular society, practicing accountants' interpretation of the accounting framework and the code of conduct is more based on contemporary education systems. Therefore, the profession, including educators, employers, and regulators, should emphasize the importance of avoiding even small moral failures.

5.2 *Accounting Philosophy*

The next aspect considered was the ambiguity in understanding accounting's primary purpose. The concept of Generally Accepted Accounting Practice/Principles (GAAP) was historically the overarching concept that guided and defined acceptable accounting practices and conventions (Epstein et al., 2005). In contemporary accounting, the idea of the accounting framework became the descriptive term when referring to the guidance of accounting practices. It also became the basis upon which the regulatory and professional institutes based their versions of accounting theory. Many scholars, such as Demski (2007) and Fellingham (2007), however, disagree with the presentation of a practice-based accounting framework as a scientific basis for accounting theory and argue instead that a proper foundation in formulating an accounting theory should rather be its ability to contribute to appropriate organizational performance conclusions. In fact, the contemporary business environment demands accounting information to support business decision-making. Therefore, a more definitive manner of formulating accounting theory should be based on acknowledging that accounting is inherently part of all aspects of the organization's economic sphere.

However, even though the organization is considered an integral part of society, it is also a separately identifiable economic entity. Accounting information is based on *value*, used to report the various components of financial statements. As such, the building blocks of accounting (and financial reports), i.e., the revenue and expense items and the asset

and expense items, must be gauged, measured, and reported by each element's relative importance to the organization's overall performance. If possible, such reporting should be robust and not lead to intermittent re-valuation and adjustment. Re-valuations, by their nature, negatively impact the comparability of financial information between different organizations and reporting periods and could also negatively affect internal organizational department comparisons.

In conclusion, a definitive accounting philosophy should include three essential pillars. The first should point to the primary purpose of accounting information, which is to report the *economic events incurred* during the organization's business operation. The second should guide the provision of *valuable, reliable, and comparable information* about the organization's operational and financial performances, thus empowering the users of such information. Third, it should also facilitate understanding *the business decisions* made upon such information.

5.3 *The Value Concept*

Expanding on the above, the study moved into the domain of the value concept. The reflection acknowledges that the efficacy of many accounting techniques is gauged by their ability to approximate the value of economic and operational events. This, however, is not as simple as may be initially thought. A standard and generally accepted understanding of what the term *value* infers is problematic—never mind how it is to be determined. The study approached this dilemma from two perspectives, as follows:

- **Quantitative perspectives:** It was acknowledged that a critical objective of accounting is to translate the organization's operations and performances into financial terms. Furthermore, such quantified information must be made available in financial reports that are relevant, reliable, and comparable. The concern, however, is *how* the organizational operations and performances are quantified; in other words, how is it valued? The way in which accountants such values (information) determine may substantially impact relevancy, reliability, and comparability. In some sense, the quantitative value of the operational and economic events and their results can be seen as a judgment of resource scarcity. Such valuation judgments, however,

can be approached from varying perspectives, including the technique and purpose thereof. In context, current accounting guidelines are moving toward so-called fair-value-based measurement and reporting techniques. There are, however, apparent concerns regarding the inconsistency and partiality characteristic of many valuation techniques. Nonetheless, irrespective of whether historical cost or fair-value-based principles are better, the crux is that the generation of accounting information must remain focused on the relevancy, reliability, and comparability aspects of reporting organizational performances.

- **Qualitative perspective:** It was acknowledged that *ethical* accounting behavior is more than professional conduct, competence, and adherence to codes. In this context, the value can also refer to a value system, and as such, the *moral* application of ethical guidelines is key to ensuring the organization's operations are socially acceptable. Stewardship is a somewhat prickly matter in contemporary accounting, and its value is often downplayed by the accounting focus on supporting the capital providers—which is just one stakeholder class. Nevertheless, the principles of stewardship must remain central because of the vital role accounting fulfills in recording and reporting the consumption of resources and the resultant distribution of the created value. Therefore, the concept of value and what is perceived to be of value have different connotations for different user classes (stakeholders) of the financial information resulting from the accounting processes.

In the context of reflective studies in typically quantitative disciplines, the difficulty is arguably therefore in being able to identify qualitative aspects within said discipline and then trying to enrich foundational aspects thereof.

5.4 *Decision-Usefulness*

The decision-usefulness concept has been central in determining accounting policies and practices *REFERENCE. It has also been foundational in countless accounting research projects for many decades. Nevertheless, there has also been some resistance to a vacuous decision-usefulness concept as critical to accounting and financial reporting

practice (and theory). The study, therefore, reflected on whether decision-usefulness is an unquestionable way to justify and guide the practice of accounting rationally. A key concern is that the accounting regulators give so much preference to the utility of the capital providers, as a stakeholder group, that a principal function of accounting became the provision of information primarily valuable for them.

Without clarification of the type of utility being sought from the financial reports, vague insinuations about the *usefulness* of accounting information are without merit. The study approached the issue of decision-usefulness objective from two angles, as follows:

- Firstly, from an *ontological* perspective, the application of accounting methods was reflected upon from the perspective of the allied concepts of *utility* versus *ophelimity*. Whereas the former is a broader value concept that assumes a value concept for a wider audience, the latter assumes independent individual values. Therefore, by focusing on the decision-usefulness objective as it is currently focused on the capital providers, the regulators are arguably not concerned with the greater good of social utility but rather on focused individual ophelimity. This may be considered as being subjective and biased toward ordinal economic gratification.
- Secondly, issues around the quantification of accounting data and its predictive abilities were considered from an *epistemological* perspective. It can be argued that the accounting information presented in financial statements is often not representative of an absolute *quantity*. Instead, it is the result of summarizing techniques that provide a window into a more complex qualitative situation. Therefore, accounting should only be seen as a measurement activity in providing a rough estimate of reality. In respect of the question of prediction, the study argued that the reported accounting information is unlikely to possess any actual predictive ability for two reasons. On the one hand, information users have different objectives when they use such information against different backgrounds. Therefore, no single report of financial information in a specific format would be able to meet the unique individual requirements of users, even within the single group of ‘capital providers.’ On the other hand, the market actions and reactions that the financial statements are supposed to help in predicting future economic events and trends operating in such a complex and dynamic environment, with many

variables and divergent market forces, that it may very well become an impossibility to claim any predictive ability.

Therefore, although the study does not reject decision-usefulness criteria out rightly, it does caution against vacuous promulgation of decision-usefulness, lacking any substantive significance.

6 RESEARCH CONCLUSION

Aside from the debate as to who the real users of financial accounting information are, the debate as to the pros and cons of various accounting methods and techniques, or even what accounting theory entails, the reality is that the practice of accounting has a clear and deep-seated impact on (1) how it is taught and (2) on multiple societal levels. As such, accounting should be seen as part of the broader social sciences. However, the academic (scientific) aspect should also be such that it contributes to academia and not merely be seen as focusing on the training of accounting artisans. The summative justification of the accounting science foundation is elucidated below.

In the context of the study's focus on accounting theory's legitimacy concern, it is important to acknowledge the relationship between accounting and philosophy. If the concept of the *philosophy of science* is seen as the consideration of, or reflection on, aspects of the application of science, then accountants should not embrace such reflection. An argument could be made that it may be better for accountants to attempt such reflection in formulating quintessential accounting theories than it is for philosophers to attempt accounting reflection. Demski et al. (2002) opined that it should be easier for aspirant accountants to master aspects of philosophy as part of their accounting education. In such a manner, accounting (as a discipline) may then offer the context in which a quintessence of an accounting philosophy may be defined. This may also prevent accountants from being seen as dilettantes throwing around 'meaningless' words as a way to dabble in academia.

It will only be able to classify accounting as a social science if the discipline (professions) itself acknowledges such. This would, among other things, mean that research in accounting must at least follow scientific rigor. Considering the principle on which contemporary accounting regulations are founded, flawed as it arguably may be, it is evident that there is at least some scientific reasoning behind its postulates. Accounting

is in a somewhat tenuous position in which the industry requirements play a significant role in how it is taught and researched. Furthermore, accounting is arguably in a similar situation in that research and practice are guided by *laws and regulations* and that normative research in accounting could enhance its scientific stature. Nevertheless, accounting is more than only the record-keeping function of economic transactions; it has widespread significance and influence on multiple spheres of society.

In conclusion, ethical failures in accounting will inevitably occur, just as in any profession where human judgment is a reality. Should this happen, the profession should not ignore such instances but acknowledge and reflect thereon and be open-minded enough to be pragmatic about the realities, noting that ethical and moral values are crucial to the profession. Although failures will occur, they should not detract from the profession's scientific legitimacy. In this context, we include the accounting profession. Furthermore, in any profession, many practitioners focus on their careers in industry, and they are less concerned with the scientific status of their chosen profession. This, however, also does not mean that the specific profession is not based on science. Again, this is very much also the case for the accounting profession.

Finally, perhaps the most significant aspect against the legitimacy of *accounting theory* is its decision-usefulness objective, including any claims of predictive abilities. Too many complex variables impact the information and users, so any claim of decision-usefulness (even for an exclusive and precisely defined user group) is nonsensical.

7 CONCLUDING REMARKS ON THE RESEARCH PROCESS

A constraint of reflective studies is that the final reaction to problems is often not found. Nevertheless, answers (or solutions) to problems are not the only reason to undertake research. Reflective research aims to contextualize contemporary issues within a *bigger picture* and to get a debate going. This was very much the objective of this study.

A further limitation in undertaking reflective studies in a typically quantified discipline such as accounting is the objectivity of the disclosed financial numbers; the quantitative techniques and the statistical analysis are lost. In such instances, there is more room for subjectivity and bias to raise its head. Any reader of such studies should, in turn, take cognizance of such possibilities. Although every effort has been made to remain as objective as possible in this study's evaluation, interpretation,

and reflections on the issues, the researcher remains human. As such, personal beliefs, opinions, and biases may be present.

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A Case Study Approach to Develop a Competitive Strategy for a Selected Automotive Distribution Company in Preparation for Saudi Vision 2030

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1 INTRODUCTION

The Kingdom of Saudi Arabia (KSA) adopted Saudi Vision 2030 as a policy initiative to introduce significant national economic and structural reforms (Saudi Vision 2030, 2018; Thompson, 2017). The purpose of

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this reform plan is to reduce the government's dependence on oil by encouraging economic diversity through the private sector (Rostan & Rostan, 2020; Stenslie, 2018). The changes proposed by this reform plan require private sector firms to radically reformulate and implement their competitive strategies in line with Saudi Vision 2030. Consequently, an investigation of the external environment is necessary before a competitive strategy can be reformulated.

The largest automotive distribution company in Saudi Arabia was selected as case study. The research evidence was collected from a pragmatic philosophical underpinning following a sequential exploratory mixed methods design to facilitate translating strategic decisions based on best practices. The competitive environment¹ of the case study was investigated by utilizing a combination of strategic models: (1) SWOT (strengths, weaknesses, opportunities, and threats) analysis, (2) PESTEL (political, economic, social, technical, environmental, and legal) analysis, (3) balanced scorecard (BSC), and (4) Porter's generic strategies; and linking it with the concept of competitive intelligence (CI). The actor-network theory (ANT) was used to provide insight into the results from these models.

The evidence in this study included the following:

- Qualitative data were collected through semi-structured face-to-face interviews with 32 senior management (also referred to as actors) in the automotive distribution company.
- Quantitative data comprised 205 questionnaires completed by employees from different departments and staff levels of the case study company.

The qualitative and quantitative results were triangulated and combined within the context of ANT and CI to formulate the actor intelligence theory (AIT). The latter can form the basis for formulating a competitive strategy during times of radical change, such as those proposed by Saudi Vision 2030.

¹ For this study, a competitive environment is defined as an environment conducive to and encouraging competitive behavior.

2 BACKGROUND OF THE STUDY

To reform the KSA economy, Saudi Vision 2030 established 13 Vision Realization Programs (VRPs), including the National Industrial Development and Logistics Program. The latter encompasses the automotive sector and is earmarked to transform the country “into a leading industrial powerhouse and a global logistics hub” (Saudi Vision 2030, 2021, p. 8).

Companies in the automotive sector operate in a competitive environment with constant technological advancements and changing customer preferences. Notwithstanding, the automotive industry in the Kingdom is dynamic, with 529,000 vehicles sold in 2019, representing the largest share in the Gulf Cooperation Council (GCC) car market (Statista, 2021; Tausif & Haque, 2018). Moreover, Saudi Arabia ended its legal ban on women driving in July 2018, increasing the demand for automotive vehicles (Faudot, 2019; Kemppainen, 2019; Krane & Majid, 2018; Randheer et al., 2017; Tausif & Haque, 2018). According to Grand and Wolff (2020), further growth in the local motor vehicle market is expected because of the rising youth population, similar to other Middle Eastern countries. These socio-economic features and its geographic position as a regional hub attract international motor manufacturers and dealers to Saudi Arabia (Al Fayad, 2014; Randheer et al., 2017). Considering all these factors, combined with the introduction of Saudi Vision 2030, automotive firms must reconsider their relative position in the marketplace. According to Porter (1980), a company’s competitive strategy depends on its ability to relate to its operating environment. The automotive industry is recognized as pivotal in the reforms proposed by Saudi Vision 2030.

Understanding the internal and external organizational environment is central to formulating or reformulating its strategy, especially as such knowledge enables management to better match internal strengths and external opportunities (Darling & Venkitachalam, 2021). Khalifa (2019, p. 136) argued that strategy is “a cohesive core of guiding decisions” firms must take during uncertain circumstances in response to reality in their environment. A company should position itself with its competitive strategy by optimizing the competitive forces.

Various strategic models have parameters or elements to gather and analyze specific information about such environments (Aithal, 2017). Competitive intelligence is the legal and ethical collection of information to monitor a firm’s competitive environment (Gračanin et al., 2015).

According to Bernhardt (1994), it is a process to understand competitors' strengths and weaknesses better to improve corporate strategy formulation. Saudi Vision 2030 is creating uncertain circumstances to which private sector firms in the KSA must respond. These firms could better understand their competitive environment and improve their competitive strategies by gathering competitive intelligence.

Each strategic model has strengths and shortcomings, and only applying a single strategic model could produce limited results. A combination of multiple strategic models, such as in this study, can compensate for the shortcomings of each tool. This study combined the SWOT, PESTEL, BSC, and Porter's generic strategies. Kaplan and Norton (2008) applied almost the same strategic model combination of BSC, SWOT, and PESTEL, but combined it with Porter's five forces model and not Porter's generic strategies.

Other research was conducted on Saudi Vision 2030, including its influence on the renewable and sustainable energy sector (Amran et al., 2020), health care (Alhawassi et al., 2018), the effect of oil prices on economic transformation (Jawadi & Ftiti, 2019), and examining female entrepreneurs in the Saudi workforce (Kemppainen, 2019). No studies were found on reformulating competitive strategies in preparation for this envisaged radical change. From the discussion, it is evident that private sector firms' competitive strategies will be affected by Saudi Vision 2030, requiring reformulation by assessing their internal and external environment using multiple strategic models.

The primary goal of Saudi Vision 2030 is to transform the economy from its dependence on oil. It requires overhauling public sector departments and impacts the strategy of private sector organizations, such as the automotive distribution company. A reformulation of corporate strategies is required to ensure, among other things, regulatory compliance to the reform plan and contending in an increasingly competitive environment.

3 RESEARCH PROBLEM AND OBJECTIVES

The Saudi Arabian private sector (with a specific focus on automotive) companies have to reformulate and update their competitive strategies to accommodate the radical changes proposed by Saudi Vision 2030. Moreover, the country is one of the least understood economies in the world (Al-Kibsi et al., 2015). Moreover, cognizance of the relations between actors and networks must be taken.

The research question can be formulated as follows: how should an automotive company develop its competitive strategy to prepare for the radical changes proposed by Saudi Vision 2030?

The primary objective of this study is to present a case study approach to develop a competitive strategy for an automotive distribution company in preparation for Saudi Vision 2030.

The secondary objectives of the study are to:

1. Demonstrate the use of an exploratory case study design in answering the research question;
2. Describing the collection of qualitative data through semi-structured interviews with senior management using a combination of multiple strategic models;
3. Discussing the collection of quantitative data gathered by the questionnaire; and
4. Presenting the triangulated results to formulate a competitive strategy for the case study company in getting ready for Saudi Vision 2030.

The results of this study will assist Saudi Arabian private sector firms in reformulating their competitive strategy in the face of the radical changes proposed by Saudi Vision 2030. Similarly, other organizations can utilize the AIT to reformulate their competitive strategies during times of uncertainty.

4 RESEARCH DESIGN

The first secondary objective is to demonstrate the use of the case study design. This will be achieved by discussing the study's underlying philosophies, followed by the conceptual framework. The case study approach will be described, including motivation for its appropriateness to this study. The second secondary objective of describing the collection of qualitative data and the third secondary objective of discussing the collection of quantitative data will be achieved by considering the sequential mixed methods and triangulation approaches followed by a discussion of the data, data collection, and analysis.

4.1 *Philosophies*

A mixed method case study approach was followed nested in a pragmatic paradigm. Kelly and Cordeiro (2020) argue that pragmatism is a fitting paradigm when investigating organizational processes—such as in this case study of developing a competitive strategy. The researchers played a participatory role in the research as the participants' perceptions were interpreted (Maree, 2020). The ontological assumptions were, therefore, subjective (De Villiers & Fouché, 2015). A competitive strategy for the automotive distribution company was developed using the data from participants. Furthermore, the researcher interpreted the interaction between the various actors and actants. These concepts are clarified in the next section.

4.2 *Conceptual Framework*

Actor-network theory (ANT) explores interconnections between humans and their technologies (O'Connell et al., 2014). Actors could be key individuals and groups, but may also comprise “things or objects,” while “actants” in ANT studies refer to “the variety of human and non-human actors” (Bryson et al., 2009, p. 179). The ANT approach is a framework used to study actors' roles in structuring networks to generate knowledge. Actors follow their preferences and preserve a firm's time and process to translate a network from heterogeneous to homogeneous (Law, 1992). A central theme in ANT is the process of translation. According to Latour (1996), translation is the consequence of drawing actors together in a network by motivating participation in organizational activities. Callon (1986, p. 224) continues by describing translation as “the mechanism by which the social and natural worlds progressively take form.” Hui (2012) posits that actors form, stabilize, and/or mobilize networks.

The automotive distribution company—the case study—will have to change to adapt to the requirements of Saudi Vision 2030. Consequently, the actors and their networks will undergo a process of translation. Similarly, the company will have to reformulate and reconsider its competitive strategy, including its vision, mission, and strategic plans. The latter is regarded by Bryson et al. (2009) as non-human elements. In this study, the concept of translation, as posited in the ANT, will be used to uncover the translation of actor and network relations in preparation

for Saudi Vision 2030. The focus will be on reformulating an automotive company's competitive strategy.

Tatnall (2005) argues that ANT can assist in studies where social, technological, and political factors interact—similar to this study where Saudi Vision 2030 proposes a radical change in the political, economic, and social environment. Bryson et al. (2009) provide additional motivation for utilizing ANT by arguing that its application is appropriate when investigating strategic planning in practice.

Based on the motivation provided, the conceptual framework of this study is reflected in Fig. 1.

The conceptual framework presented in Fig. 1 reflects that a firm's competitive environment is elucidated by collecting information about its internal and external environment using a combination of strategic models: (1) SWOT analysis (Weihrich, 1982), (2) PESTEL analysis (Daft & Weick, 1984), (3) the BSC (Kaplan & Norton, 1992), and (4) Porter's generic strategies (Porter, 1985). These strategic models also

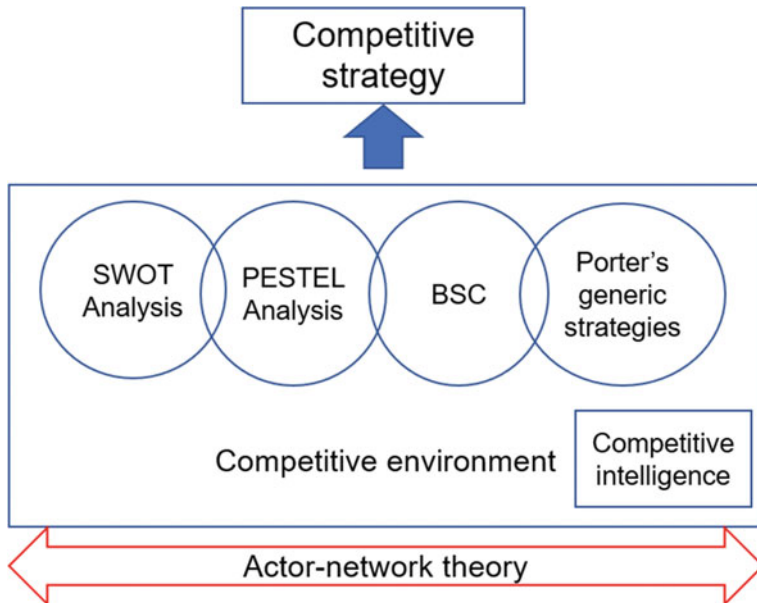


Fig. 1 Conceptual framework

gain competitive intelligence about a firm's competitors. Translation, as a central theme of ANT, was used to understand and explain the relations of human and non-human actors during times of radical change.

4.3 *Case Study Approach*

Exploratory research was conducted at an automotive distribution company by following the case study approach. The case study approach displays the following characteristics: (1) a real-life phenomenon is investigated (Yin, 2014), (2) the phenomenon is investigated in its natural "habitat" (Iacono et al., 2009), and (3) it is an in-depth description of the phenomenon (Hancock & Algozzine, 2016). Case study research is defined by Cooper and Morgan (2008) as an in-depth examination of a contextualized organization to enhance theory. Lane et al. (2010) strongly argue for using an exploratory case study design encompassing a sequential mixed method approach. They propose a two-stage data collection: firstly, collecting qualitative data followed by quantitative data collection. In line with this, an exploratory case study approach was followed as limited knowledge exists about the topic. Furthermore, using a single case study allowed the researcher to conduct an in-depth examination of the organization primarily as the formulation of strategy is an internal process using information not publicly available.

Despite the strengths of case study research, some authors have raised concerns that the findings cannot be generalized, and that methodological rigor can be improved (Gibbert et al., 2008). To address these concerns, the researcher paid specific attention during data collection to enhance methodological rigor (Gibbert et al., 2008; Yin, 2013), and a theory was designed (AIT) to overcome the lack of generalization. Notwithstanding, Merriam (2009) believes that the strengths of case study research outweigh its limitations as it offers solutions to practical problems and provides much-needed knowledge about real-life phenomena.

As a further motivation for using the case study approach and contextualizing the findings using ANT, other studies have combined this approach with ANT, for example Harritz (2016) and Naar and Clegg (2018).

4.4 *Sequential Mixed Method and Triangulation*

The research evidence was gathered by collecting qualitative and quantitative data, i.e., a sequential mixed methods approach. We decided to follow this approach based on the argument by Gobo (2015, p. 330) that “mixed methods constitute one of the most important contemporary trends in social and applied research.” A single method cannot “fully capture the phenomenon,” but combining methods allows for complementary strengths and weaknesses (Abowitz & Toole, 2009). Saunders et al. (2009) assert that it is a practical approach to mix various perspectives to enable a better interpretation by the researcher. Bazeley (2016) provides further motivation for using the mixed method approach by reporting that, similar to this study, most case studies follow a mixed method approach.

After the qualitative and quantitative evidence was gathered sequentially, a triangulation process was followed. Triangulation aims to establish the reliability and validity of responses in determining the extent to which similar questions yield similar responses and whether the same underlying issues were identified (Hesse-Biber, 2010). Triangulation is when two or more data sources are used to corroborate the research findings (Daymon & Holloway, 2010; Saunders et al., 2009; Yin, 2006). For these reasons, this study followed a mixed method approach and then combined the research evidence using triangulation, as Saunders et al. (2009) suggested. A sequential approach was followed to collect the qualitative data through interviews with senior representatives and, secondly, quantitative data through a questionnaire developed from qualitative insights. The qualitative and quantitative data were analyzed separately and then compared using triangulation. The latter was performed in line with Maree’s (2020) advice of confirming that the conclusions from the qualitative sources supported the quantitative perspective.

4.5 *Data, Data Collection, and Analysis*

The sequential exploratory model—as used in this case study—is time-consuming, considering that there are two data collection phases to be completed (Creswell & Creswell, 2017). This study’s two data collection phases were done in a sequence of the qualitative phase, followed by the quantitative phase.

For the two data collection phases, two sampling methods were used respectively:

- For the first phase, probability cluster sampling was used, and
- Each data selection method (qualitative and quantitative) for the second phase utilized other sampling methods, including purposeful and random sampling.

Cluster sampling is a probability sampling technique based on “clusters”—a natural-occurring grouping (Saunders et al., 2009).

Qualitative Data Collection (Interviews)

Various hierarchical levels exist in the case study company and are spread across eight departments: (1) Finance, (2) Information Technology (IT), (3) Human Resources, (4) Sales, (5) Strategy, (6) Marketing, (7) Risk Management, and (8) Shared Services. These hierarchical levels represent “clusters.” The first phase sample was drawn from the population comprising the top management of the automotive distribution company. In the second phase, purposeful sampling was applied to these “clusters” (Yilmaz, 2013). The criteria to purposively sample individuals were based on the relevant experience of the company and the corporate strategy process. Yilmaz (2013) supports this sampling technique in qualitative research by positing that a small number of participants are selected to gather in-depth knowledge.

Although each department plays a role in implementing the corporate strategy, the top management is more experienced in strategy formulation and decision-making. Additionally, the representation of actors at different hierarchical levels from various departments is crucial, especially in determining whether their interests are aligned. A combination of senior management, middle management and operational staff is necessary to gather evidence of the perceptions of all actors. Denis et al. (2007) report that top management, viewed as key actors, controls the interests of other actors to ensure that each actor stays committed and aligned with the organizational goals.

The researcher identified 32 potential participants from the automotive distribution company. The profile of these participants includes:

- Senior managing director (1), managing director (5), director (12), senior general manager (11), and general manager (3); and
- Twenty-six of the 32 participants had more than ten years of experience at the company, indicating that they are familiar with the environment, actors, and networks.

The purposively selected sample received an e-mail request for an interview. The e-mail stipulated the details of the questions to be asked and the interview duration. An attachment with the university-approved letter requesting an interview and describing the topic and ethical considerations was included. Other than some participants proposing alternative time slots, most interview requests were accepted. The researcher accepted all proposed changes of the time or place.

In-depth face-to-face semi-structured interviews were the data collection instrument utilized to collect qualitative data because this is the best-recognized technique for a qualitative approach (Walliman, 2017). The interviews were conducted in a meeting room at the company's premises and at the participants' convenience. Semi-structured interviews were selected as the researcher could interpret each question to ensure that participants understood it before responding (Alase, 2017). Furthermore, open-ended questions were used, allowing interviewees to articulate their views using their own words.

At the commencement of an interview, the researcher explained the various strategic models such as SWOT, PESTEL, BSC and Porter's generic strategies, and the concept of CI. These interviews were conducted in November 2018 over four weeks.

Q1—"Is the company a competitive environment?"

The first question aimed to establish whether the senior management team, i.e., the key actors, perceived the company as a competitive environment, i.e., conducive to and encouraging competitive behavior. The SWOT analysis, namely strengths, weaknesses, opportunities, and threats, was used as the basis for these questions.

Q2—"What are the challenges of Saudi Vision 2030 on the company from the PESTEL perspectives?"

This question aimed to establish the influence of the external environment on the case study since the announcement of Saudi Vision 2030. The PESTEL analysis is a strategic tool used to investigate the external

environment. Furthermore, the relationships between human and non-human actors and their external environment are essential to the ANT translation process.

Q3—“Are the company’s actors and network homogenous (ANT)?”

This question intended to establish whether the interests of key actors were aligned (homogeneous) using the BSC. The latter is utilized as an internal performance measurement tool. The assumption is that when employees are rewarded based on key performance indicators (KPIs), their interests align with corporate goals. The question required senior management to consider which KPIs measure actors’ performance as part of the BSC.

Q4—“Does the company have a robust competitive strategy?”

The key actors had to (1) describe the current corporate strategy, (2) opine whether the current strategy aligned with one of Porter’s three generic strategies of cost leadership, differentiation, or focus, and (3) suggest a strategy the company could follow in preparing for Saudi Vision 2030. Additionally, the question verified whether the key actors shared views of the company’s strategic direction. This alignment in strategic view could indicate homogeneity.

Q5—“Is the company prepared and ready for Saudi Vision 2030?”

This question again confirmed whether the key actors were aligned in their strategic direction by asking whether they perceived the company to be ready for Saudi Vision 2030.

Q6—“Does the company comprehend and apply CI?”

As discussed, actors’ performance can be enhanced, and interests aligned through translating and sharing knowledge. The company can use CI as a tool to translate knowledge. For this reason, the question investigated whether the key actors comprehended and applied CI.

The interviews were transcribed and analyzed by manually coding each transcript. Central themes were developed and used to design the questionnaire utilized in the quantitative data collection process.

Quantitative Data (Questionnaire)

The sample for the quantitative data collection was determined using the same population and “clusters” based on staff levels in the eight departments as the first phase. Random sampling was deemed appropriate for the second phase to select respondents.

The senior managers are responsible for determining strategy, while the sampled employees implement the strategy as they are responsible for operational activities.

The population size is approximately 4,000 employees from the automotive distribution company. Neethling (2009) proposes using a sampling size of 5% of the population totaling at least 200 employees ($4,000 \times 0.05$). The 200 respondents were sourced from the eight departments but not in the same ratio. Bernard (2017) proposes that the sampling interval should depend on the population size and the number of units in the population. However, this is not easy to execute in practice because each cluster's employees had to be convinced to complete the questionnaire. For this reason, 280 questionnaires were distributed to try and obtain the targeted 200 completed questionnaires.

The same six research questions utilized in the qualitative phase were used to compare the qualitative and quantitative data. The interview data established the perceptions of the key actors in the company. The same questions were used to test the perceptions of the other corporate actors to allow for triangulation. The motivation is the establishment of alignment between actors' interests and the corporate network objectives. According to Sarker et al. (2006), ANT emphasizes that senior management should not only share strategic direction, but this vision should also serve the remaining actors' interests.

The questionnaire was designed with "closed-ended" questions based on the central themes (refer Table 1) during the qualitative phase of the perceptions of key actors. A five-point Likert-type scale was used (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree).

After making follow-up phone calls and holding short meetings, including obtaining the senior management's support, the researcher obtained the targeted sample. The quantitative data collection occurred during March and April 2019, and 205 responses were received.

Descriptive analysis (including frequency, distribution, means, and standard deviations) was used as the data analysis technique for the quantitative data.

Triangulation

Two sources of data were collected—qualitative and quantitative—and then compared using a triangulation process, as Saunders et al. (2009)

Table 1 Results of the qualitative investigation

Qualitative data analysis			
Question	Category	Codes	Central Themes
i) Could you identify the strengths of your firm (internally)?	SWOT	Strengths	- Loyal associates - Brand name - A firm values: respect, improve, pioneer and empower
ii) Could you identify the weaknesses of your firm (internally)?		Weaknesses	- The bureaucracy in decision-making processes - Communication effectiveness - The poor role of H.R. (recruiting, training and retaining talents)
iii) Could you identify the potential opportunities for your firm (externally)?		Opportunities	- Saudi Vision 2030 - Digitalization - Expansion in the automotive sector
iv) Could you identify the potential threats (challenges) for your firm (externally)?		Threats	- The regular changing in government rules and strict regulations - Slowdown and economic recession - Korean and Chinese competitors
By referring to the competitive environment (C.E.) could you identify the challenges of Saudi Vision 2030 on your firm from the following perspective?	PESTEL	Political challenges	Saudi Vision 2030 brings up some challenges in terms of: Saudization, increases of fuel and utility prices, in addition to taxes and other governmental fees
		Economic challenges	There are some challenges, but the automotive firm is confident about its position
		Socio-cultural challenges	The automotive firm is benefiting from female employment and -driving
		Technological challenges	From technological perspectives, the automotive firm is facing this challenge irrespective to Saudi Vision 2030
		Environmental challenges	The automotive firm is a pioneer, proactive and eco-friendly firm.
		Legal challenges	The automotive firm considers this as part of the political perspective.
By referring to BSC and the performance measurement within your firm, what are the key performance indicators (KPIs) used to assess the following perspectives?	BSC	Financial performance	The automotive firm is applying several KPIs and is financially strong.
		Customer value	The automotive firm is applying several KPIs and has good relationships with its customers and could acquire and retain them for a long time.
		Internal process effectiveness	The automotive firm is applying some KPIs and has an effective internal process and efficient network
		Learning and growth	A lack/gap was identified in knowledge sharing, cultural behaviour, teamwork and fair treatment.
In terms of a competitive strategy: i) Describe your firm current strategy? ii) In your opinion, which of the following strategies have your firm followed or implemented? a) Cost leadership, b) Differentiation, or c) Focus. iii) What strategy do you suggest your firm to follow?	COMPETITIVE STRATEGY	Current strategy	Significant focus is placed on customer
		Defining strategy	The automotive firm is applying a differentiation strategy by providing unique and high value products and services to its customers
		Proposing a strategy	The automotive firm needs to redesign/formulate its current strategy

suggested. The qualitative data were collected first by conducting semi-structured interviews with senior management representatives from the case study company, followed by quantitative data collection through questionnaires completed by operational staff. The results from these two sources were compared to confirm whether the conclusions from the qualitative sources supported the quantitative perspective, as Marea (2020) advised.

5 RESEARCH EVIDENCE

5.1 *Qualitative Data Collection (Interviews)*

The interview results of questions 1–4 are presented in Table 1.

In response to the fifth question of whether the company was prepared and ready for Saudi Vision 2030, the key actors concurred that the company was prepared. Regarding question 6 of whether the concept of CI is comprehended and applied, almost all the participants confirmed that they are familiar with it and appreciate the value and importance thereof.

Quantitative Data (Questionnaire)

The descriptive analysis is presented in Table 2.

Table 2 shows that the average responses for the overall 31 questions agreed with the findings per the qualitative phase. This is reflected by a mean of around 4 out of 5 (with 5 being “strongly agree”).

Table 2 Descriptive analysis of responses per perspective/model

<i>Per perspective/model</i>	<i>N</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Variance</i>
Overall_31 Questions	205	4.0121	0.46349	0.215
A_Questions_SWOT	205	3.9835	0.45606	0.208
B_Questions_PESTEL	205	4.1061	0.53624	0.288
C_Questions_BSC	205	3.9012	0.84905	0.721
D_Questions_COMPETITIVE STRATEGY	205	4.039	0.62934	0.396
E_Questions_SAUDI VISION 2030 & CI	205	4.0065	0.79003	0.624
Valid N (listwise)	205			

Triangulation

The fourth secondary objective is to present the triangulated results to formulate a competitive strategy for the case study company in preparation for Saudi Vision 2030. From the qualitative data collected from the senior actors, it was evident that they mostly agreed on their perceptions about the company's strengths and weaknesses and potential opportunities and existing challenges as identified by the interviewees. For this reason, we can assume that the senior actors' interests align with their thoughts and actions in terms of the SWOT analysis. Walsham (1997) argues that this indicates network success. Moreover, the questionnaire analyses found that the middle and operational level employees concur greatly with the senior actors and support their perceptions about the company. Therefore, the senior actors are deemed connected with the other actors in the SWOT analysis as there are slight differences in the actors' views at the various hierarchical levels. This may indicate that actors and networks are in a translation process toward homogeneity. It must be noted that the focus was not on determining whether individual actors bring value to the company but on better understanding the translation of actor and network relations when reformulating its competitive strategy in preparation for Saudi Vision 2030.

With regard to the PESTEL analysis, it was found that the senior actors were not in agreement on the political (P of the PESTEL) and economic challenges (first E of the PESTEL). Furthermore, the senior actors and lower staff levels raised concerns about the BSC's internal processes and learning and growth perspectives. These findings underline opportunities for improving the alignment of actors' interests in these areas and indicate possible heterogeneous relationships, especially considering that innovation, creativity, and talent management are continuous processes. To further support this conclusion, the qualitative and quantitative responses recommended the redesign/reformulation of the corporate strategy. Jayne and Dipboye (2004) concur by stressing that creativity is enhanced through networks with concentrated levels of interpersonal understanding. In such networks (teams), actors feel inspired, can appreciate the individuality of others, and increasingly share their opinions and perspectives.

This study argues that jointly applying ANT and CI reinforces competitive strategy. These two concepts must be combined to suggest a competitive strategy for the automotive distribution company in preparation for Saudi Vision 2030. Therefore, a new theory/conceptual model

was designed that combines the concepts of ANT and CI, the actor intelligence theory (AIT). “Actor intelligence” postulates that intelligence is drawn from gathering knowledge. It is proposed that a company should systematically gather and produce this knowledge using the CI network within the organization. Subsequently, the higher-level (or key) actors will steer the company toward meeting its strategic objectives by implementation by operational level staff. Furthermore, the translation process will gain momentum as knowledge-sharing leads to increasingly aligned interests between actors of all hierarchical levels.

Figure 2 reflects the AIT, albeit a model to design the competitive strategy of the case study company. To reiterate, AIT draws from the ANT’s themes of interest alignment by actors (homogeneity) and translation perspectives and the CI knowledge-sharing concepts.

Figure 2 illustrates the four dimensions of networks, translation, CI, and actors. It reflects that these dimensions are interdependent, with each dimension empowering and reinforcing the next. These lines of dependence may weaken or strengthen. For example, gathering knowledge and turning it into CI empowers the human and non-human actors to improve decision-making and ultimately optimizing individual and corporate performance. Turning knowledge into intelligence through translation strengthens the networks, thereby increasing the alignment of interests between actors (homogeneity). The latter reinforces the company’s competitive environment and builds its competitive advantage under the auspice that actors apply CI to their networks. We argue that when CI is embedded in a company’s network, actors will be empowered and motivated to improve their performance. These actors then translate corporate strategy into sustainable performance to support the firm’s competitive environment. The importance of continuously upgrading its CI system will then be reinforced. The interdependency of each of the four dimensions is therefore apparent.

6 RESEARCH CONCLUSION

The case study approach was appropriate to address the research question of how an automotive company should develop its competitive strategy to prepare for the radical changes proposed by Saudi Vision 2030. The triangulated results led to the design of the new actor intelligence theory that

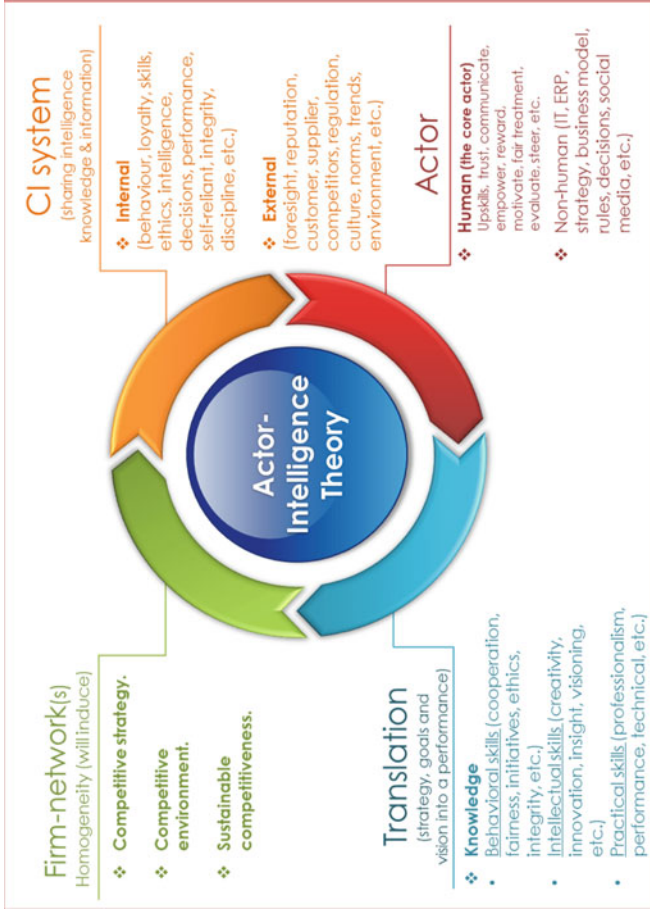


Fig. 2 Actor intelligence theory

firms can use to formulate/reformulate their competitive strategy, especially during times of reform. AIT is offered as a solution to the research problem.

7 CONCLUDING REMARKS ON THE RESEARCH PROCESS

The announcement of the Saudi Vision 2030 reform plan was met with enthusiasm but also created uncertainty. Furthermore, KSA is one of the least understood economies in the world. For these reasons, a case study approach was selected. As the researcher was (and remains) an employee of the automotive distribution company, the data collection process could be deemed more manageable. However, as a case study approach necessitates in-depth investigation (Dubois & Gadde, 2002), the researcher had to collect sufficient evidence to solve the research problem. The challenges encountered during this process were not securing an adequate number of interviews and completed questionnaires during the first phases of data collection. This necessitated the researcher to send multiple e-mails and requests for participation. Furthermore, interviews were conducted in Arabic and had to be translated to English before data analysis and coding could begin, which was time-consuming. The limitation that the results of case studies cannot be generalized was overcome by the design of the actor intelligence theory, which can be applied by any organization during times of uncertainty or even just in reformulating their strategy.

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A Risk-Based Approach to the Acquisition of Electronic Mine Safety Equipment

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1 INTRODUCTION

Safety in mining is a legislative requirement, with all mines obliged to adhere to safety legislation in its national context. The South African Mine Health and Safety Act (MHSA, 2009) defines the obligations of local mines in specific terms. However, a significant disconnect was observed with electronic safety equipment between a system's acquisition and utilization life cycle phases from a systems engineering perspective. These phases represent different cultures: a developmental (or project)

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culture in the acquisition phase and a repetitive (or cyclic production) culture in mining operations.

A development method was identified as a solution to address the gap between acquisition and utilization, with a specific focus on risk reduction and full life cycle sustainability in the form of cost-effective solutions accepted by its end users (miners). Design science research was used to provide a research paradigm that translated real-world requirements to a theoretical space for in-depth theoretical analysis, with mixed methods research utilizing the advantages of both qualitative and quantitative methods. Qualitative research was used to define the research context, while quantitative research was applied in experimental research.

From an archival literature study on risk assessment and mitigation methods, as well as different documented case studies, qualitative results were obtained to define the theoretical model functionality, structure, and performance. In addition, a real-world case study was used to develop prototype safety systems (in the form of safety equipment instances) that served as candidate systems in a technology evaluation and selection process. Finally, by following the systems engineering development process and from the application of risk analyses modeling, a risk-reduction method emerged called activity-based risk (ABR).

Operational risk analyses were conducted using detailed operational models' workflow, state space, and failure mode analyses. Experimental research was conducted to analyze the risk exposure of miners (hazardous exposure) and system availability (production gain/loss) for different safety system candidates and human behavioral risk characteristics. By considering empirical data from experimentation on different safety systems, human behaviors, and their failure modes, it was possible to obtain an optimal target function set that provided the lowest risk and highest production availability (van der Merwe, 2014). All systems were implemented and evaluated in practice, resulting in the acceptance of the most cost-effective candidate.

2 BACKGROUND OF THE STUDY

The South African deep mining environment poses significant challenges in terms of operational risk, explicitly relating to the safety of miners when exposed to hazardous areas in the workplace. As a result, legislation enforces risk mitigation in the form of regulatory control. Regulations, such as the Mine Health and Safety Act of 1996 (MHSA, 2009), place

an obligation on the mine and the provider of safety equipment to follow the spirit of the law. However, this leaves room for interpretation and misalignment, which may be to the detriment of the end users as safety equipment is developed to meet minimum safety requirements.

The impact of not complying with regulations, combined with the occurrence of a fatal or severe injury, is high: mining operations are typically halted until a full investigation has been completed and the underlying cause has been identified and addressed. In addition, the country stands to incur significant losses if mines are shut down due to serious accidents. Most accidents are caused by human error. Therefore, it is essential to understand and optimize the interaction between technology and humans to prevent accidents and losses (van der Merwe et al., 2017).

In deep mines, a significant amount of time and effort is spent at the proverbial rock face where hazardous areas are present. Activities inside these areas expose miners, technicians, and contractors to operational safety risks (hazards). As a result, a wealth of literature exists on the topic of operational safety, its risks, and its mitigation methods (van der Merwe, 2014). One of the approaches to mitigate risk is to ensure risk is managed effectively in the safety equipment procurement phase. The aim is to ensure all risks are identified, analyzed, and mitigated, and processes are put in place to ensure risk is managed throughout the overall equipment life cycle.

Procurement of safety equipment in mines requires evidence that a responsible process has been followed with respect to safety. This often becomes a task allocated to the provider of safety equipment given all constraints introduced by a specific hazardous environment, as was observed in practice. The business interface between the equipment provider and the mine is complex as it involves multiple business units of the mining company, including departments of engineering, production, and mine safety, as well as unions representing the mine employees. These entities must collaborate to minimize the risks that new safety equipment introduces, which in turn demands multiple requirements definition sessions and associated risk analyses and mitigation planning activities.

Specifically, the significant discontinuity observed in the business interface between engineering functions (responsible for acquisition) and mining (responsible for operations) posed a challenge. An opportunity was identified to address this discontinuity by means of a research project that will inform the alignment of engineering and operations functions

by following a systems engineering (SE) full life cycle process. High-level tasks of the SE process had to be analyzed, and areas of improvement identified with risk reduction as an objective. It was understood that the different cultures in engineering and operations would never be fully harmonized. However, an agreed process with appropriate risk management methods would allow both phases to interface more effectively with the common goal of producing safety solutions that address all regulatory, safety, and production requirements.

2.1 Research Problem and Objectives

Observations from operations, technical documentation from mines, and regulatory documents were used to define research challenges commensurate with the primary research problem. These include, broadly, (i) functional capability shortfalls in the business processes that were in use at the time, (ii) sub-optimal safety technology selection, (iii) lack of focus on the integrated operational system, (iv) mostly reactive approaches to risk management, and (v) limited human resource integration in system risk analyses efforts.

The primary research problem was defined as follows: “In the full life cycle of electronic safety equipment, a risk management discontinuity exists between acquisition and operational phases” (van der Merwe, 2014) (Fig. 1).

The primary research objective of this study was to address the primary research problem by providing an abstract, generalized framework for an acquisition process for electronic safety equipment from a risk-based, full life cycle system perspective.

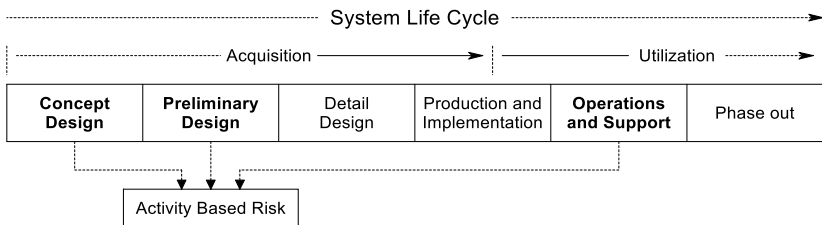


Fig. 1 System life cycle phases

The following research challenges were identified from observations, mining research data, and case studies to address the research challenges:

- Detail requirements for safety systems were not defined in a systematic way;
- Sub-optimal safety technology was often implemented;
- The focus was on hazardous exposure alone and not on system functions;
- There was a lack of integration and limited full life cycle perspective;
- The focus of risk assessment was expert input and hazard-based;
- A reactive incident risk management approach was mostly followed;
- The impact of specific technology was not measured using a standard norm;
- There was a lack of human integration in system-wide risk assessment.

A design science research (DSR) paradigm was used to deliver design artifacts (Gregor & Hevner, 2013; Hevner, 2007; Hevner et al., 2004). Prototypes, in the form of electronic safety equipment, had to be researched and designed for integration into the operational environment in the mine. The DSR paradigm was used to address the real-world problem in a high-risk environment, which imposed specific, pragmatic requirements and limitations, namely:

- The research had to consider valuable human lives and had to be conducted responsibly without introducing risk in the form of harm or loss;
- A real-world solution was required, implying the use of applied research as part of a local mine's procurement project;
- The research formed part of the research and development process of an electronic safety equipment provider.

The following research guidelines were found to be of value considering the requirements and constraints, namely, to utilize:

- Design science research to facilitate real-world modeling, with the deliverables of this research including design artifacts;

- Case study research on particular safety equipment to obtain decision support information from experimental data (Yin, 2014);
- A trusted research and development process as human lives were at risk, hence the need for a proven systems engineering (SE) process (Blanchard & Fabrycky, 2006).

The constraints listed above allowed the research and development of safety equipment in a controlled environment, including its real-world validation and verification, before being deployed in a high-risk operational environment.

With mining, there is always a trade-off between productivity and safety as these are competing factors in a production environment. The balance between productivity and safety is critical. It must satisfy both the needs of the mine production and safety teams, with the engineering team being responsible for selecting appropriate safety equipment. Hence, the study had to focus on finding this balance as an additional constraint. The first workable solution does not necessarily address this critical requirement, and the final aim was to achieve a balance between these opposing forces while finding the most cost-effective solution.

In an engineering environment, candidate safety systems must be evaluated. A successful system will utilize safety equipment that has been compared against competitors and minimum requirements as determined by mining regulations. To be successful, a candidate system is thus compared against a fixed reference (minimum requirements) in an absolute manner and against optional systems (candidates) in a relativistic way. When all systems meet minimum requirements in terms of functionality, any candidate stands to be successful, with the minimum requirements to be adjusted based on the affordability of the successful candidate. It is known that zero risk is not achievable and that the lowest reasonably practicable (ALARP) risk is used in real-world situations (Joughin, 2011). The mine's risk appetite will determine the cost-effectiveness threshold of a safety system in a specific high-risk environment.

3 RESEARCH DESIGN

The research paradigm is provided by DSR, as shown in Fig. 2.

DSR provides an environment inside which the real-world problem, shown on the left in the diagram, can be translated to a theoretical domain to the right. Real-world requirements were translated from the mining

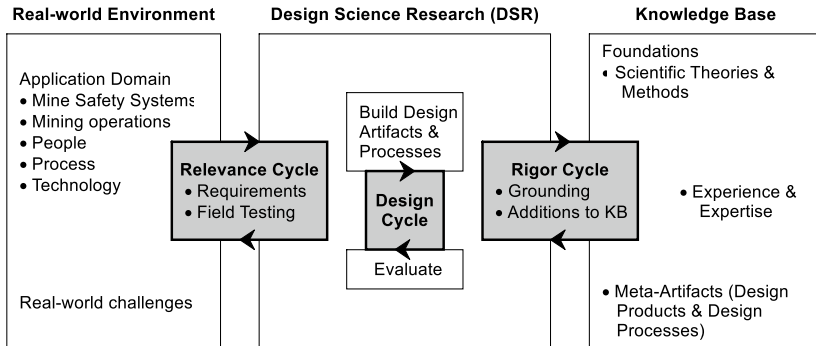


Fig. 2 DSR as a research paradigm (*Source* Adapted from Hevner [2007])

environment to define the theoretical models used in experiments. In turn, theoretical models from the knowledge base were used to define safety equipment functionality and performance requirements.

3.1 Research Philosophy

The research philosophy, given the context, is pragmatic in that a workable, grounded solution had to be obtained for a safety system development environment that had been (from a theoretical perspective) ill-defined (Goldkuhl, 2011). Sound methods for risk management did exist at the time, but the clearly disconnected interfaces between (i) safety system acquisition and utilization life cycle phases and (ii) the real-world domain and the theoretical domain had not been addressed (Leveson, 2012). This further underlined the need for a thorough case study on the safety system procurement project to fully understand the high-risk mining environment, which created the ontology for the research and development project.

From a philosophical perspective, the creation of knowledge on a risk-reduction method to ensure aligned acquisition and utilization also addressed a critical epistemological need. It is important to note that, during development, a controlled theoretical environment and a controlled physical test environment were available. These environments' characteristics had to represent the real world as far as practically possible, based on the need for a safe solution. Even though the real-world and theoretical environments were functionally aligned, the integration of the

methods and artifacts into the real world still presented a material physical risk. Therefore, the responsibility to conduct ethical research was considered a high priority and only fully verified, and validated safety equipment was allowed to be used in the actual physical environment (Kivunja & Kuyini, 2017).

3.2 *Research Approach*

The translation of real-world challenges to an academic environment introduced the concept of emergence to the research project, which is an inductive methodology (van Alstyne & Logan, 2007). Emergence, in this context, originated from the repetitive interaction between the real world (practice) and the body of knowledge (theory) following a method of rapid prototyping and reflection. Rapid prototyping allowed the development of prototype test models of safety equipment, allowing the researchers to learn from its application in simulated and controlled real-world environments. Theories contained in the body of knowledge informed the development of prototypes in an incremental and iterative fashion, supporting the emergence of a new theory.

The DSR paradigm, combined with rapid prototyping and iterative and incremental development, supported the notion of an inductive approach. A new theory, called ABR, was defined from the research based on reflection that followed the safety system development, with a specific focus on risk reduction (van der Merwe, 2014). Prototype development, in turn, was enabled by systems engineering principles from the need to produce a safety system that does not add residual risk. The systems engineering process thus provided a means to ensure validation (“doing the right thing”) and verification (“doing the right thing right”) were conducted responsibly.

It must be noted that, although an inductive approach was followed to produce design artifacts, the end result could not have been achieved without the use of deductive reasoning (Hammond & Wellington, 2013). Deductive reasoning was used to test theoretical models obtained from the real-world environment, while inductive reasoning was used to construct a new theory of risk management as a combination of prior theories and creative input.

Also, qualitative and quantitative approaches were used to varying extents in this research, resulting in a mixed-methods approach (Yin, 2014). A qualitative approach considered documented processes,

methodologies, and supporting theory, while the quantitative approach was followed during the numerical analysis of system performance in a simulated environment. The focus was on the creation of a new method, making the primary research approach inductive.

3.3 *Research Strategy*

Research Methods

Due to the complex nature of a research and development (R&D) project, all relevant research and development methods available were applied as outlined. It must be noted that the research methods were used within the DSR paradigm (which is not a research method). The research methods employed in this study are as follows:

- *Documentary Research*: Different research topics were identified and researched (Hammond & Wellington, 2013): systems engineering to define the system's full life cycle and environment; risk modeling to ensure system failures can be defined, modeled, and analyzed; human error and failure to define human behavior in complex systems; and modeling techniques using operations modeling software (van der Merwe, 2014). The systems engineering process was specifically researched as it informed the research and development process (Blanchard & Fabrycky, 2006; Holm & van der Merwe, 2019b; Walden et al., 2015).
- *Case study research*: A case study for the development of an underground (deep mine) safety system was defined, from which a pragmatic method for controlling operational risk during the acquisition phase of the system life cycle was derived (Yin, 2014). The case study was used to ensure focus on one specific outcome: learning from the research and development of the safety artifact and adding value to the theoretical knowledge base. An in-depth understanding of the disconnect in the interface between the acquisition and utilization phases of the full life cycle was the main objective;
- *Experimental research*: Experiments were conducted using defined and controlled computer simulations (Hammond & Wellington, 2013). Specific characteristics of the real-world operational environment were obtained and used to define the set of parameters used in controlled experiments using realistically validated operational

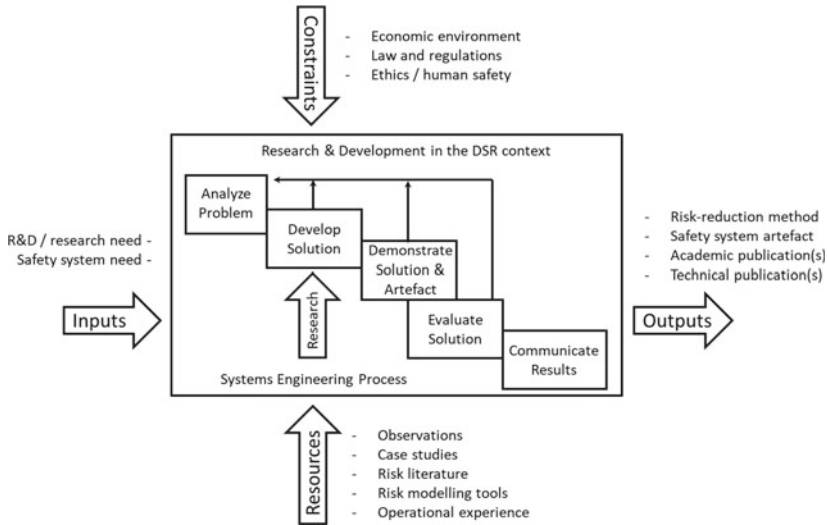


Fig. 3 R&D in the DSR paradigm (*Source* Adapted from van der Merwe [2014])

simulations. Simulations were done using the SIMIO™ operational simulation software package to model, run, and evaluate multiple real-world scenarios as obtained from the detailed analysis. Results were used to evaluate system performance, identify, and control critical operational parameters while studying simulation models' performance outcomes. Results were used to inform the safety system's operational processes and architecture (Fig. 3).

Research and Development Process

Due to the complex nature of design science research, with specific reference to the diversity of stakeholders and participants in this context, it was necessary to define the research and development process (van der Merwe, 2014):

- Conduct documentary research: Processes, tools, and methods were researched to ensure a responsible research and development process

was followed in a high-risk environment. This was done using documentary research and provided a complete set of tools of risk analysis in a real-world environment;

- Perform system analysis: The real-world “AS-IS” manually operated system’s functions were mapped to theoretical and equivalent computer models, including all human–machine interfaces. This was done using results from the case study by applying operations research and analysis tools;
- Simulation modeling: State models were derived from converting workflow tasks and sequences to a closed-form state model for simulation purposes. A suitable simulation package, SIMIO™ (Pegden & Sturrock, 2013), was used to ensure system parameters could be varied in a controlled and relativistic manner (Embrey & Zaed, 2007; Leveson, 2004);
- Model volatility of human resources: Human behavioral parameters were included in the form of probability distributions for Monte Carlo analyses. These were captured in volatility tables, where each such table was used to adjust human performance in a controlled and relativistic manner;
- Identify candidate systems: Different candidate systems were defined, and the computer models adjusted to accommodate variations where gaps were evident. The candidate models were derived from the case study model (manual) and proposed automated models from requirements obtained from the mines. All candidates were evaluated for functional capability;
- Perform ABR analysis: For all models, workflow activities were grouped in different risk-based categories and individually studied using simulation experiments. Behavioral characteristics of humans were used as independent variables while system parameters were adjusted (functions, sequences, resource types, and time). Dependent variables included hazardous exposure (risk) and production availability, both expressed as loss factors. High-risk activities were prioritized;
- Optimize risk and production loss: For each candidate safety system, the performance indicators were used to compare system performance. It was highly instructive to relate system design parameters (form/fit/function) to system performance to identify the target function set and its configuration (architecture).

Three main observations were made from the study (van der Merwe, 2014):

- When the SE process was followed for rapid prototype development (to physically create the candidate safety systems), the lack of focus on the preliminary design phase was identified. This phase is between a concept (typically provided by regulatory authorities) and the physically implemented equipment. This was identified as a significant acquisition risk and clarified the disconnect between safety system acquisition and utilization;
- In the preliminary design phase, it was observed that significant value could be added by using a focused risk-reduction approach. The performance-risk method that isolated and addressed high-risk activities, as encapsulated in the above process, was named ABR (van der Merwe et al., 2017). Its focus is to identify high-risk activities and to reduce risk in each such activity in an iterative manner. This method emerged from the definition of the research and development process, confirming the perspective of emergence in iterative design cycles;
- An interesting design research management method emerged from the R&D effort. In order to align SE and R&D in a sensible way, it was necessary to align both research and development objectives, as well as the development schedule. This had to be done to ensure the expectations of all stakeholders were met. As a result, a method called Quality Research Management (QRM) emerged from the application of quality management principles to R&D (Holm & van der Merwe, 2019a). This method draws parallels between schedule-sensitive real-world project management and less time-sensitive research.

The research framework is shown in Fig. 4 with methods used to define the research environment inside the real world. The value of QRM was to ensure the different ontologies (real-world environment and academic environment) were aligned in terms of the quality of the resulting design artifacts, the developed knowledge, and the time schedule.

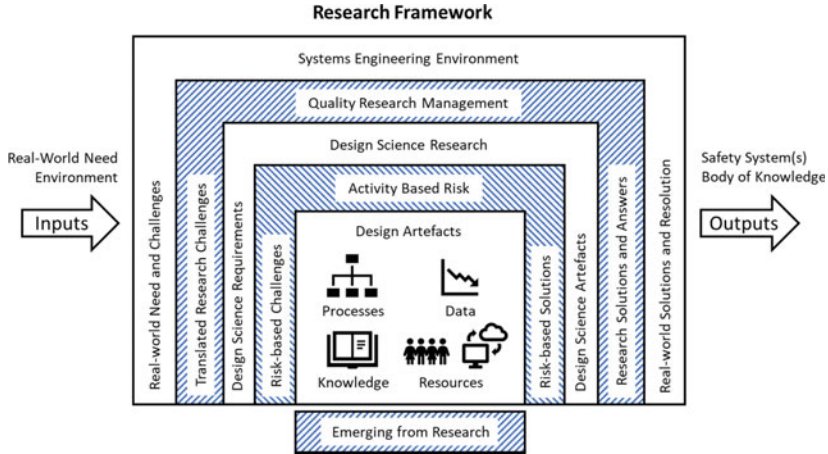


Fig. 4 Research framework used in this study (*Source* Holm and van der Merwe [2019b])

Data, Data Collection, and Analysis

Data were acquired from research and also generated from experiments by employing both cross-sectional and longitudinal collection methods. Cross-sectional data were obtained from simulations in experiments at a given point. Variation over time was inevitable as the development of artifacts was done over a longer period of time, with reflection points aligned with formal artifact development reviews. In an interesting way, the iterative artifact development approach provided incremental improvement since physical prototypes provided valuable performance baseline data.

Longitudinal results (resulting from iterative design and improvement) were obtained from the safety system artifact that evolved over time, which converged into an artifact with an accepted function set. This was true not only for the safety system itself but also for the methods used for risk reduction (ABR) and research management in a complex environment (QRM), as these methods also evolved during the research project. This evolution is in line with emergence being an inherent characteristic of design innovation (van Alstyne & Logan, 2007).

Qualitative Data

Real-World Observational Data

Observational data were obtained by recording operational processes and associated performance data by performing workflow and performance analyses (van der Merwe, 2014). Observations were converted to comprehensive workflow and state space models to obtain (i) dynamic/behavioral models of operational activities and (ii) resource models encapsulating roles and responsibilities with all interdependencies.

These models were thus mapped and used as digital representations of the actual high-risk operational environments with the advantage that digital model adjustments would not introduce material risk. Human behavioral data were obtained from operations analysis and inputs from experienced mining operators, safety officers, and engineers. The digital models were validated by verifying model states and modes against actual operations.

Theoretical Literature on Risk

Content analysis was done on the literature on theoretical risk analysis, following the documentary research approach (archival research). Importantly, focus was placed on event tree analysis, fault-tree analysis, and failure mode effects and criticality analysis using relevant texts that address these methods (Altabbakh et al., 2014; Arunraj & Maiti, 2007; Khan & Abbasi, 1998; Marhavilas et al., 2011; Misra, 2008; Tixier et al., 2002). Human behavior was specifically relevant to the study and was extensively researched to define human-machine interaction and failure modes (Dekker, 2001, 2006; Hallbert et al., 2006; Reason, 1990).

Failure modes were identified and incorporated into the workflow models of the case study. Resource failures at different points in the state models resulted in functional failures when critical functions could not be executed (capability failure) or variability was evident (performance variation).

A model was constructed for each safety equipment prototype, allowing a detailed analysis of human behavior with respect to a specific model. As a result, the sensitivity of the system robustness with respect to human behavior could be studied from the models in a virtual environment.

Case study data served to validate models further and added a legislative perspective. This was done to ensure mine safety regulations were considered in line with the Mine Health and Safety Act of 1996.

*Quantitative Data***Experimental Data**

Quantitative data were obtained from experimental results. The theoretical models, constructed and validated against real-world operations, were used to simulate different scenarios. A scenario was created for each safety system model (four in total) using combinations of human resource risk levels as defined by their volatility, resulting in 25 scenarios for each risk activity. For example, high-risk mining cultures would result in high-risk decisions and actions miners make, while the opposite is true for low-risk cultures. All possible failure scenarios were incorporated in the Monte Carlo analyses using SIMIO™.

For each of the four candidate systems, 14 risk activities and 25 scenarios were considered. For each activity, it was observed that 200 simulation runs were required to obtain a confidence level of 95%, with a confidence interval of a width of 6% for the hazardous exposure factor (HEF) and production loss factor (PLF) (when expressed as percentages). The average results for HEF and PLF from the 200 simulation runs (for each scenario) were used to compare candidate systems' HEF and PLF as functions of human variability.

Productivity/risk balance points were found by comparing the HEF of miners in hazardous states with the PLF obtained from system downtime. A system with both low HEF and PLF would be desirable as it would present low hazardous exposure to miners while ensuring system availability for production. The resulting HEF and PLF values were used to compare candidate system performance, after which a final iteration was used to reduce system cost.

4 RESEARCH EVIDENCE

Evidence was obtained in different forms. In the DSR context, evidence was obtained from theoretical models that were validated against real-world models (relevance in terms of requirements and field testing of fully functional artifacts). In the theoretical space, a new method was derived to produce an artifact based on grounded theory (iterative prototyping and reflection provided data that guided the development of ABR as a theory).

The complexity of the problem required experimentation and simulation, which in turn provided input to the artifacts and the theoretical model, supporting the notion of emergence. Results from simulations

showed that the introduction of safety controls in candidate systems had different effects, as described below:

- *Manually operated system*: This system, given different scenarios as defined above, resulted in high-risk exposure (HEF) and high production availability (low PLF), which was not a desirable result as the system introduced operational risk;
- *Automated system (high complexity)*: A fully automated candidate system of high complexity resulted in low HEF and low availability (high PLF) due to introduced operational delays. This was predicted to be a risk on its own as the system would be bypassed in order to achieve production targets, which was verified from system evaluation in the controlled environment;
- *Automated system (medium complexity)*: Results from a semi-automated system of medium complexity confirmed that this candidate system provided both low HEF and PLF. In this system, functions of high risk were removed (using ABR), and productivity increased significantly. As a result, a balance was obtained for mines with a medium-to-high safety culture;
- *Automated system (low complexity)*: Only critical safety functions were retained for this semi-automated candidate system. An increase in safety was observed relative to the manual system, with an almost comparable availability. That is, a low HEF and PLF resulted. This was a cost-reduced system that should be applied in an environment with a high safety culture.

An analysis of the above results provides valuable insights:

- The first important insight is that the introduction of an automated system was necessary to reduce severe injuries on duty and fatalities, as can be seen from the HEF value in the manually operated system;
- Secondly, the mine defined the functionality of the highly complex system as a “wish list” of features, which resulted in an over-design of this candidate system that restricted operations by limiting production availability. The highly complex candidate system was tested, and functions that hampered production were bypassed (by means of sabotage), resulting in a more unsafe system;

- Thirdly, the removal of limiting functions using the first ABR iteration resulted in a system that is optimal in terms of robustness but expensive relative to the manual system. This system would be ideal when used in medium-to-high safety culture environments;
- Finally, by further removing costly functionality and retaining safety-critical functions, the final candidate system resulted in a cost-effective solution in mines with high safety cultures.

Hence, the ABR method expressed as steps in the risk management process resulted in artifacts that addressed the research challenge after: (i) theoretical models had been derived from real-world operations, (ii) experimental methods had been applied to generate data in a complex controlled environment, (iii) a theoretical model for risk management in development had been created, and (iv) the ABR method had been applied to produce a product that was accepted by the mines.

In Table 1, the research validation matrix (RVM) obtained from the QRM method links research challenges, literature sources, and research solutions in three sections from top to bottom in the matrix. This matrix implements the “voice of the customer” in a quality framework to ensure validation of research can be achieved for the problem, literature, and creative input as part of the solution. In this case, the voice of the customer was translated to research challenges in a way to support DSR.

Research challenges were defined from information sources, as shown. The arrows pointing down show which sources were used to define relevant challenges. Similarly, literature focus areas show which literature relevant challenges. Similarly, literature focus areas show which literature sources were used to further support challenges (arrows pointing up) and which literature sources were used to define research solutions (arrows pointing down). This table provides a convenient way to visualize the complete research process and how the research can be validated. Traceability from challenges to solutions supports communication.

5 RESEARCH CONCLUSION

The primary research objective of this study was to reduce mine safety risk by devising a method which proactively aligns the electronic safety equipment acquisition and operational phases in the system life cycle.

Validated simulation results, as verified against operational systems, indicated that risk reduction is possible using a defined procedure. It is acknowledged that all mines do not have the ability to conduct

Table 1 Research validation matrix

Mine Health and Safety Act	↓		↓		↓	↓	↓	↓
SIMRAC Documentation	↓		↓		↓	↓	↓	↓
Mining Documentation	↓		↓		↓	↓	↓	↓
Observations during Case Studies	↓	↓	↓	↓	↓	↓	↓	↓
Information sources								
Research challenges	Detail requirements are not defined	Sub-optimal safety technology often implemented	The technology on hazardous exposure	Lack of integration and full life cycle perspective	Risk assessments are mainly expert input and hazard-based	Reactive incident risk management approach is followed	Impact of specific technology is not measured using a standard norm	Lack of human integration in risk assessment
Literature focus areas								
Risk definition and terminology				↑	↑		↑	
The risk management framework		↑	↑	↑↓		↑	↑	↑
Risk analysis methodologies	↑	↑		↑	↑	↑	↑	↑
Existing risk assessment tools	↑	↑↓	↑↓	↑↓	↑	↑↓	↑	↑↓
Human/operational modeling					↓	↓	↓	↑↓
Systems engineering	↑↓	↑	↑	↑↓	↓	↓		↓
Literature focus areas								
Research solutions	Define detail system requirements in Preliminary Design	Follow an integrated approach	Follow a balanced approach production, (technology, safety, usability)	Follow an integrated SE approach	Use functional analysis during preliminary design to obtain all relevant information	Follow a proactive risk management approach	Follow a relativistic approach when comparing technologies	Introduce resource risk ratings to determine the operational effectiveness
Activity-based risk								
Define AS-IS system				↑				
Design TO-BE system				↑				
Analyze candidate systems	↑	↑	↑	↑	↑	↑	↑	
Build a generic simulation model	↑	↑			↑		↑	
Do volatility tables for humans		↑					↑	↑
Obtain risk response measures		↑					↑	
Evaluate and compare models		↑		↑		↑	↑	↑
Do activity-based risk analysis		↑	↑	↑		↑		↑
Identify high-risk activities		↑	↑			↑	↑	↑
Optimize system (risk and cost)		↑	↑			↑	↑	↑
Implement selected system		↑		↑		↑	↑	

detailed simulations on safety equipment, but this task may be allocated to subject matter experts in this field. The resulting risk analysis and mitigation method, ABR, emerged when risk activity groups in the overall operational process were identified, prioritized, and analyzed for risk.

ABR can be used to determine the robustness of integrated safety system risk with respect to candidate technology solutions. This allows operational risk owners to select optimal solutions in a complex operational environment.

The research paradigm, strategy, and methods were applied to (i) qualitatively define the research paradigm and context, (ii) derive complex theoretical models, and finally, (iii) conduct experimental research for quantitative (empirical) analysis purposes.

In the ABR procedure, modeling will most likely rely on qualitative data from operational analyses, and simulations should always produce empirical results for quantitative analysis. From simulation results and operational data, it will be possible to gain theoretical knowledge from empirical data for a specific environment, its required safety equipment, and the risk culture of the organization in question. The models resulting from the ABR procedure will remain effective until the operational environment changes significantly but will most likely be adaptable for incremental change.

The role of reflection and emergence must be underlined. After each development review, in which a prototype was created, reflection was deliberately done to obtain a more generalized method. Design science research supported this reflection as it forced the researcher to perform abstraction of real-world functions, resources, and their interdependencies. Systems engineering provided the tools (specifically, functional analysis principles) to perform abstraction, which simplified the reflection process significantly. Visual representation of an operational environment is highly effective when reflecting. Modeling and simulation allowed in-depth understanding, which provided additional insights from experimental results. As a result of this approach, the ABR method emerged, and the original research challenge was addressed.

6 CONCLUDING REMARKS ON THE RESEARCH PROCESS

Advanced modeling techniques in the preliminary design phase of the system's full life cycle were used to producing effective, relevant products. The biggest challenge was the lack of testing in a typical mining environment for ethical reasons (as human lives are at stake).

Selecting statistical parameters for theoretical models was particularly challenging. The ABR process provided a relativistic approach to address this issue, which simplified the comparison of risk performance between candidates. This allowed the researchers to determine the sensitivity of parameters and the direct risk impact of each parameter.

Due to the legacy culture, a specific challenge was to challenge conventional risk-based methods (hazard analysis) in the mining environment. It was necessary to provide clear results and visual models to demonstrate the effectiveness of the ABR process and its outcomes.

Expert knowledge is required to fully understand the system's operational requirements in order to perform the ABR process. Access to the mines and specific underground areas is restricted. However, operational knowledge of these environments was necessary to understand the system complexity and cultures.

Limited data were available to define the final system characteristics, and three systems had to be physically developed to verify and validate the results. All candidate systems were tested and implemented in a controlled environment to ensure the effectiveness of the ABR process.

Finally, the QRM framework aligned all research phases by using the Research Validation Matrix (RVM) discussed above. In a complex research and development environment, this method provided research requirements, traceability, progress tracking, and validation for effective research management.

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Developing a Channeling Framework for Healthcare Service Provider Networks for a Medical Scheme in South Africa

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I BACKGROUND

To remain sustainable, medical schemes must continually innovate due to rising medical expenses. However, the Medical Schemes Act (MSA) and the Council for Medical Schemes (CMS) regulate the South African medical schemes. This research undertook to develop a medical service provider channeling framework in this complex and regulated environment. The envisaged framework had to be easily manageable, comprehensive, and secure, with the ability to guide members to well-ranked

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medical service providers, typically high-quality providers with lower cost impacts.

This chapter aims to demonstrate the research process applied in developing an appropriate solution for curbing medical expenditure through proper network channeling. The research is approached as a case study, focused on a South African medical scheme. Since the research is focused on an actual business problem, a pragmatic elaborated action design research (eADR) approach guided the mixed-methods research strategy. As a research method, eADR creates design knowledge by developing artifacts in a particular setting (Mullarkey & Hevner, 2019; Sein et al., 2011), which is an appropriate approach for this real-life business problem. The research encompassed both quantitative and qualitative aspects. The former included scrutinizing secondary quantitative data, including about 200 000 medical scheme beneficiaries, while the latter consisted of semi-structured interviews with various stakeholder groups.

The research process spanned three phases, namely:

- Phase 1, in which an initial framework was conceptualized; followed by
- Phase 2, in which an α -design framework was piloted and tested with a sample of medical service providers; and finally
- Phase 3, in which a second β -design framework was developed, based on feedback from phase 2, and validated by various key stakeholders.

It must be noted that the chapter's focus is to elaborate on the application of the selected research approach. Nevertheless, some contextual empirical results are also provided to provide a complete understanding of the research.

2 INTRODUCTION OF THE STUDY

As alluded to earlier, expenditures on medical and healthcare services are continuously rising. In the South African medical environment, such a rise can be ascribed to a multitude of factors, including:

- Healthcare inflation above the Consumer Price Index (Erasmus & Fourie, 2014);

- Medical and pharmaceutical innovation and development (Custer, 2016);
- Longevity of members, which increases the utilization of healthcare benefits of members (CMS, 2015);
- Increase in the burden of disease (Venter et al., 2013);
- Higher hospitalization-related costs (Erasmus & Fourie, 2014; Venter et al., 2013);
- Staff shortages (Venter et al., 2013);
- Increased cost due to prescribed minimum benefits-related legislation (CMS, 2015).

The concept of *prescribed minimum benefit* (PMB) is defined in Regulation 8 of the MSA and requires medical schemes to fully fund PMB conditions (Registrar, 1998). However, although PMBs are to be fully funded, the MSA allows for some control of the potential risk stemming from members' varying healthcare needs (CMS, 2011). Such controls include *designated service provider* (DSP) networks and linked medical and healthcare providers that entered arrangements with medical schemes to provide related services at agreed-upon prices (CMS, 2010).

As the entry point into the healthcare system, the role of the *general practitioner* (GP) as a primary healthcare provider is often critical. GPs are typically independent, private medical practitioners essential in guiding patients along the healthcare supply chain. As such, GPs are the gatekeepers that:

- Provide initial consultation services and refer members to the appropriate medical specialists, and
- Provide follow-up interferences, including supplementary medical assessments and the prescription of related consumables.

The primary healthcare providers' advice guides the patients (medical scheme members) in their healthcare journey and often plays a role in their overall medical well-being (Halse et al., 2012). A long relationship between the members and the healthcare providers and the managed care organization (medical scheme) can be developed by fostering trust in healthcare providers and related service providers.

3 RESEARCH PROBLEM AND OBJECTIVES

3.1 *Introduction*

As contextualized above, healthcare costs are increasing at a rate that can substantially increase member contributions to such an extent that private medical cover can become unaffordable to many. Medical schemes attempt to curb costs while providing quality healthcare, such as applicable networks, health incentives, applying medicine formularies, and even stricter pre-authorization or benefit option rules. Globally, healthcare service provider profiling has become the norm, and medical schemes can identify service providers with cost-effective practices. Because this information is available to medical schemes, it provides an ideal opportunity to ensure these providers take proper care of the medical scheme's members.

Considering the above, the desire for medical schemes to (at least somewhat) control the continually rising healthcare-related costs motivates the study. In context, however, it is crucial to acknowledge that *cost impact* and *service quality* often go together in the form of more extended hospitalization, more frequent theater times, and even readmissions. Two aspects should be noted:

- Firstly, all members can choose their medical service provider in the South African context. Network channeling should therefore be employed in such a manner that the members don't experience it as limiting their free choice.
- Secondly, if a service provider is prepared to accept the medical scheme's terms and conditions, such provider is eligible to join the medical scheme provider network. A challenge is to objectively guide scheme members to those providers with the optimum cost impact without being guilty of nepotism.

The ultimate objective is to alter the present recurrent practices so that better-ranked providers get preference without changing the perceptions and experiences of the member and the medical service provider. That is, the member's choice of the service provider must not be denied, but better-ranked service providers should receive more referrals.

Therefore, the primary objective of the research was to design a network referral framework for medical schemes in which members can

be objectively and effectively channeled to preferred medical services providers.

In attaining the above, the secondary research objectives comprised of the following:

- i. To define the present scenario and motivate how a DSP network and preferred network channeling can benefit all stakeholders.
- ii. To develop, evaluate, and validate a healthcare provider referral framework through the iterative eADR process.

3.2 *Stakeholder Theory*

As can be expected in a wicked scenario such as this, many stakeholders are involved, hence, this research's grounding in the stakeholder theory. Various management theories can be used to define, understand, and clarify business relationships, in which each theory may have its own perspective, purpose, validity standards, and implications (Filipovic et al., 2010). Stakeholder theory, as initially proposed by Freeman (1984), distinguishes the (internal and external) stakeholders' priorities. Stakeholder theory proponents justify the theory by arguing that all stakeholders with a sincere interest in the organization contribute to its sustainability and that there should not be specific precedence of one stakeholder over another (Smith, 2003). Whether the priorities are perfectly aligned, all legitimate stakeholders should benefit, and their expectations met.

In context, the envisaged channeling framework aims, among other things, to find a solution that helps the medical scheme, the members, and the healthcare service providers. Thus, while effective cost management is crucial, the medical scheme still must commit to easy access to quality healthcare for its members.

4 RESEARCH DESIGN

4.1 *Methodology*

The honeycomb approach (as proposed by Wilson, 2014) was used to explain the comprehensive research methodology to address the research objectives, and guide the primary research concepts (Fig. 1).

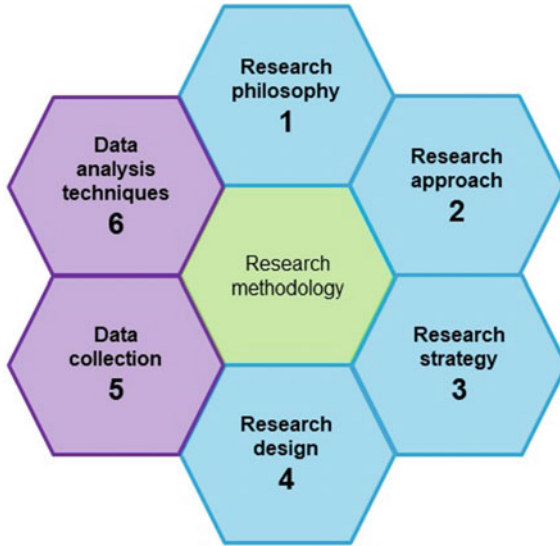


Fig. 1 Honeycomb research methodology (Source Adapted from Wilson [2014])

As indicated, the honeycomb research methodology comprises the six key research elements of philosophy, approach, strategy, and design, together with data collection and analysis techniques (Wilson, 2014). While the honeycomb approach shows the elements as sequentially numbered segments, it acknowledges that the thought process is not linear but somewhat adjacent to each other. The six elements combine circularly to structure the methodology, as reflected in the center of the honeycomb.

As applied in this research project, the above elements and the appropriate motivation for selecting thereof are indicated in Table 1.

Table 1 provides a synopsis of the research design guided by the honeycomb research methodology's elements. As indicated, the epistemological, ontological, and axiological paradigms form the basis of the *research philosophy* and are centered on interpretivism, subjectivism, and bias, respectively. Note that interpretivism aims to understand the research problem from the perspective of those who experienced it (Schwandt, 1994), which links with the stakeholder theory applied.

Table 1 Application of research methodology

<i>Element</i>	<i>Approach</i>	<i>Clarification</i>
Research philosophy	Epistemology: <ul style="list-style-type: none"> • Interpretivism 	<ul style="list-style-type: none"> • Inclusive and accepting of multiple viewpoints • Input and viewpoints from stakeholders were considered throughout
	Ontology: <ul style="list-style-type: none"> • Subjectivism 	<ul style="list-style-type: none"> • Primary researcher is a manager at the medical scheme • Stakeholder viewpoints were influential to the research
Research approach	Axiology: <ul style="list-style-type: none"> • Biased Inductive	<ul style="list-style-type: none"> • Primary researcher's perceptions played a role • Considers the research objective and focus via a mixed-method research strategy
Research strategy	Mixed method	<ul style="list-style-type: none"> • Quantitative: Claims analysis • Qualitative: Interviews
Research design	eADR: <ul style="list-style-type: none"> • Case study 	<ul style="list-style-type: none"> • eADR relies on intervention, deals with critical issues, and focuses on ensemble artifacts • The case-specific framework was developed through the iterative eADR cycles of problem formulation, artifact creation, evaluation, reflection, and learning
Data collection	<ul style="list-style-type: none"> • Primary data • Secondary data 	<ul style="list-style-type: none"> • Semi-structured interviews were held with various stakeholder groups • Actual historical data were collected from the medical scheme's normal operations
Data analysis	<ul style="list-style-type: none"> • Descriptive statistics • Inferential statistics 	<ul style="list-style-type: none"> • Descriptive analysis was used during the problem formulation phase • Inferential data analysis was used during the α- and β- design phases

The applied *research approach*, which was primarily inductive, was affected by evaluating the research focus and objective and selecting various research techniques to generate the recommendation (artifact). This mixed-method *research strategy* included both quantitative and qualitative methods. Within the eADR context, the quantitative method claims data analysis formed part of all iterations in the context of the artifacts' testing and validation. Even though the qualitative interviews were

supportive in the problem formulation and evaluation phases, they were geared toward validating the research design and outcomes. Although a mixed-method strategy is not common to interpretivist research, Young et al. (2020) claim that such an approach may result in more sophisticated research, which, according to McChesney and Aldridge (2019), is often linked to stakeholder input. In this case study's *research design*, where a pragmatic solution is required to address the business problem existing in a corporate environment, the eADR method was well suited. In context, the iterative cyclic approach of eADR enabled the continuous evolution of the envisaged artifact.

The *data collection* had two dimensions. The secondary data collection primarily included historic operational claims data and structured interviews with relevant practitioners and stakeholders. Both descriptive and inferential *data analysis* techniques were used. The former was used in cases where data linked to specific medical procedures (hip replacements, cesarean sections, and cataract surgery—as explained later) were evaluated during the eADR diagnosis phase. After completion of both the α and β -design phases, inferential analysis of sampled data was used to assess the results and gauge the progress. Useful predictions and presumptions were made based on such sample data.

4.2 Empirical Study

Action Design Research

From a holistic perspective, the research was completed in three sequential and supportive phases as part of an iterative research and development process, as indicated in Fig. 2.

Figure 2 confirms the need for a pragmatic channeling framework during the diagnosis phase. Subsequently, the artifact's design was completed during two iterations of the design phase. Firstly, the α -design is an initial pilot concept, followed by the β -design phase culminating in an improved digital framework.

The empirical research was essentially guided by the *action design research* (ADR) approach, which, according to Petersson and Lundberg (2016) and Sein et al. (2011), is systematically guided by its seven principles, as follows:

- i. Research that is inspired by real-life issues and problems.
- ii. Artifacts (solutions to the problem) based on scientifically sound theories.

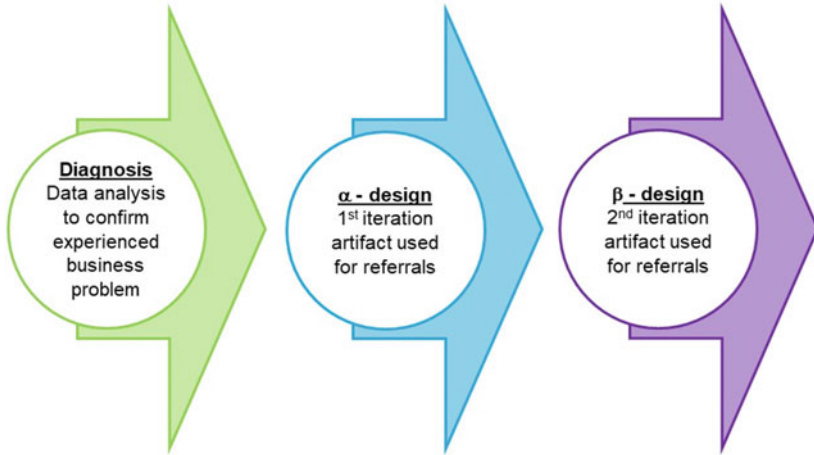


Fig. 2 Primary research phases

- iii. Artifacts that are shaped by collaboration between stakeholders, i.e., the reciprocal interaction between academic model/theory and the real-world environment, ultimately aimed at improving the model and its instantiation.
- iv. All stakeholders (academic and industry) are influential in the artifact's development.
- v. Reliable artifacts are subject to continuous and concurrent evaluation.
- vi. Artifact developments are guided by the overall research process.
- vii. Results should be generalizable and able to inform theory development.

Even though there are typically seven ADR principles, it is possible to add an eighth principle, i.e., abstraction, in which an attempt is made to reduce the solution to its essential characteristics (Mullarkey & Hevner, 2019) thus elaborating thereon.

Elaborated Action Design Research

The eADR approach consists of iterative intervention cycles starting with a diagnosis phase, followed by the diagnosis, implementation, and evolution phases (Mullarkey & Hevner, 2019). Furthermore, as indicated in

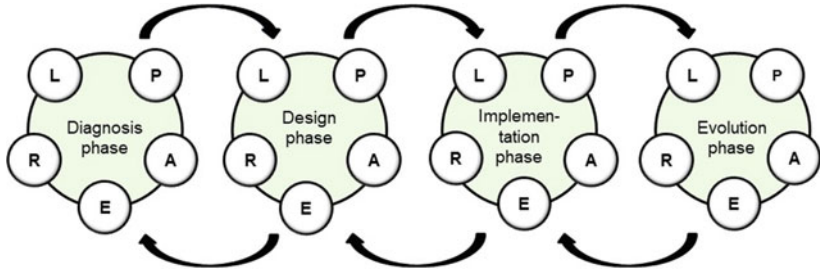


Fig. 3 eADR phases (Source Adapted from Mullarkey and Hevner [2019])

Fig. 3, each phase can be expanded into cycles that include problem formulation/planning (P), artifact creation (A), evaluation (E), reflection (R), and learning (L).

In the study's context, the 1st (diagnosis) and 2nd (design) phases of eADR were applicable. The earlier mentioned eight principles were linked to and applied within the various phases and activities of the research. The application of the principles is indicated in Table 2.

As per Table 2, the 1st principle emphasizes the importance of the complexity of the *practical* business problem experienced in South African medical schemes. In contrast, the 2nd principle focuses on *theoretical* foundations pertinent to the definition and formulation of said problem. The 3rd, 4th, 5th, and 6th principles of reciprocal shaping, mutually influential roles, authentic and concurrent evaluation, and guided emergence were applied throughout the research to ensure that the problem and solution formulation could be generalized in the context of the 7th principle. Finally, abstraction of the problem and solution development, as per the 8th principle, was applied throughout the various stages of the research.

Cyclic Research Activities

The five cyclic eADR activities were applicable in all three iterations per the diagnosis and design phases. Figure 4 provides a summation of each process within each step.

The above illustration indicates the problem definition, artifact creation, evaluation, reflection, and learning activities within the three eADR phases. Even though any of the eADR phases can be used as either the entrance or exit point for a particular problem, depending on the

Table 2 Application of eADR principles

<i>Principle</i>	<i>Diagnosis phase</i>	<i>Design phase (2 iterations)</i>
Principle 1: • Practice-inspired research	<ul style="list-style-type: none"> Defining the wicked, real-world healthcare industry problem A suitable artifact should guide members toward better-ranked medical service providers while still providing members with access to quality service 	<ul style="list-style-type: none"> Refining the problem and conceptual solution and considering the obstacles faced when channeling members toward higher-ranked providers It should be a practical, workable solution
Principle 2: • Theory-ingrained artifact	<ul style="list-style-type: none"> An analysis of the <i>what-if</i> situation was completed as part of the diagnosis phase of the ADR process in the context of stakeholder theory 	<ul style="list-style-type: none"> The design was based on existing theories, discussed in the diagnosis phase, that an artifact that channels members toward higher-ranked service providers will provide a service of better quality and cost-efficiency
Principle 3: • Reciprocal shaping	<ul style="list-style-type: none"> Historical data used in problem definition were verified through continuous discussions with stakeholders 	<ul style="list-style-type: none"> The design activity goes through the reiterative, cyclic approach and two eADR iterations within the design phase
Principle 4: • Mutually influential roles	<ul style="list-style-type: none"> Provider consultants, scheme management, and actuaries were actively involved in every research phase, including the design phase 	<ul style="list-style-type: none"> Provider consultants, scheme management, and actuaries were actively involved in every research phase, including the design phase
Principle 5: • Authentic and concurrent evaluation	<ul style="list-style-type: none"> Continuous evaluation and opinion-seeking by the researcher from management, actuarial consultants, and provider consultants 	<ul style="list-style-type: none"> The artifact was evaluated by management and the provider consultants, who also introduced the artifact to the specialists and GPs and conveyed their feedback

(continued)

Table 2 (continued)

<i>Principle</i>	<i>Diagnosis phase</i>	<i>Design phase (2 iterations)</i>
Principle 6: • Guided emergence	<ul style="list-style-type: none"> • The artifact should be relevant, usable, and therefore implemented for the organization based on the theoretical framework • The organizational problem should be addressed in a practical solution 	<ul style="list-style-type: none"> • The artifact developed in the α-design provided a basis for evaluation to learn from and improve the β-design iterations
Principle 7: • Generalized outcomes	<ul style="list-style-type: none"> • The <i>defined</i> problem can be generalized across the healthcare industry 	<ul style="list-style-type: none"> • The <i>refined</i> problem, as well as the developed artifact, can be generalized to member channeling across various areas of the healthcare industry
Principle 8: • Abstraction	<ul style="list-style-type: none"> • The artifact developed in the diagnosis phase served as the framework for creating the artifact in the subsequent design phases, using the historical data as the foundation for the initial artifact 	<ul style="list-style-type: none"> • The artifact developed in the design α-phase was the pdf version of the framework • The artifact developed in the design β-phase was the digital version of the framework

specific scenario (Mullarkey & Hevner, 2019), the diagnosis phase (in context) may serve as the most opportune point of entry (Sein & Rossie, 2019). Furthermore, within each of the eADR phases, the refinement of the problem is viewed as the point of entry (Mullarkey & Hevner, 2019).

Per Fig. 4, the various iterations of the applied eADR phases entailed the following:

- **Diagnosis:** This phase initially focused on defining the experienced business problem and identifying possible data sources to support the envisaged artifact formulation. Historical data were obtained and analyzed to develop an initial referral framework as a conceptual solution. The diagnosis phase was completed by stakeholder validation of the framework and planning for the next iteration.

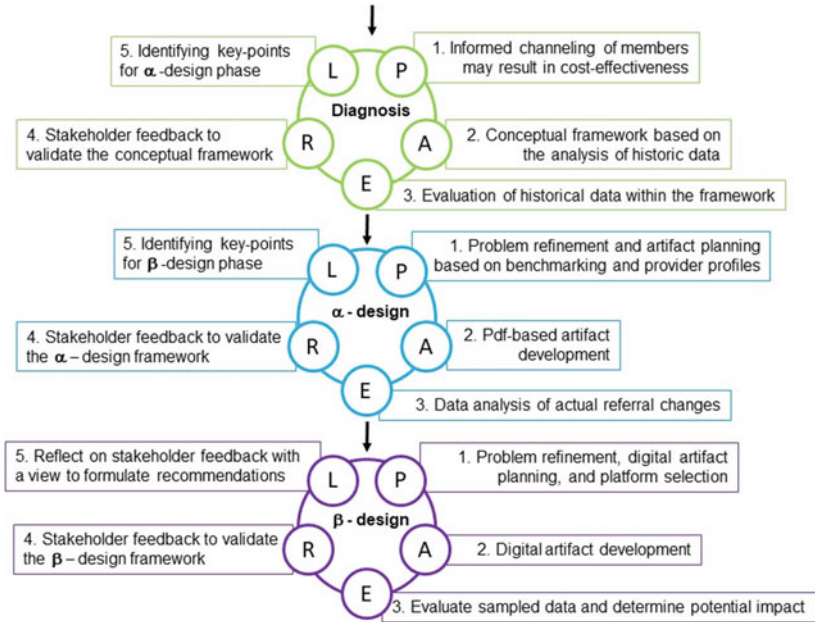


Fig. 4 Summary of the application of ADR activities

- **α -design:** The first design iteration focused on planning the pdf-based artifact, considering available healthcare service providers and relevant industry benchmarks. Once the pdf-based artifact was designed and implemented, the data analysis centered on actual referral changes for the sampled medical procedures and structured interviews with applicable stakeholders enabling the validation of the data and the solution concept, as well as the identification of potential gaps. Based on this knowledge, the planning of the digital artifact got underway.
- **β -design:** The second design iteration focused on refining the problem and the planning of the digital artifact. Once completed, data were extracted and analyzed to determine the medical scheme's potential financial impact (cost savings). Finally, the research team reflected on feedback from various stakeholders to validate the data and the artifact as a basis for business and research recommendations.

5 DATA COLLECTION AND ANALYSIS

The 5th eADR principle specifies authentic and concurrent evaluation. In adhering hereto, the review and validation of knowledge gained occurred throughout the various project phases. This enabled the research team to guide and influence the research process and the artifact design decisions.

Actual data (quantitative knowledge) were derived from the medical claims database for three selected medical procedures. During structured interviews and discussions (qualitative knowledge) with the actuaries, as a stakeholder class, three medical specialist areas were identified as suitable areas providing data with high volumes of medical claims to serve as the basis for the framework development. The procedure selection criteria were based on:

- **Consistency:** The administrative functions require that the combination of medical procedure codes is consistent between different medical service providers.
- **Volume:** There had to be adequate procedural and related claim data volumes, meaning the selected procedures should be *standard* medical procedures.
- **Financial impact:** To properly gauge the financial implications and possible cost savings, a wide cost spread between the procedures was required, meaning that at least one procedure should be relatively more expensive than the cheapest procedure.

The selected medical procedures decided upon were:

- Orthopedic surgeons with hip replacement surgery.
- Gynecologists with caesarean sections.
- Ophthalmologists with cataract surgery.

Within the above categories, the identified service providers were analyzed and ranked based on a *cost impact score*, including the applicable costs of the procedure and admission.

5.1 *Diagnosis Phase*

The key objective of the diagnosis phases was to understand the business problem and determine whether there is merit in pursuing a solution.

Table 3 Diagnosis: Potential improvement

<i>Procedure</i>	<i>Pre-artifact volume</i>	<i>Post-artifact volumes</i>	<i>Potential improvement</i>
Hip replacement surgery	268 cases	50 cases could be channeled to higher-ranked service providers	19% improvement
Cesarean section	1 702 cases	757 cases could be channeled to higher-ranked service providers	44% improvement
Cataract procedures	1 504 cases	270 cases could be channeled to higher-ranked service providers	14% improvement

Table 3 provides the summative findings of a high-level analysis of historical claims data.

Table 3 indicates the actual volume of procedures considered in analyzing the historical data during the diagnosis phase—excluding any apparent outliers. As per the post-artifact volumes, a manual analysis of the data identified the number of cases that could have been allocated to more cost-effective service providers—if the envisaged channeling concept was in force. These numbers show the most significant possible impact, maybe on the cesarean section (gynecologists) channeling, with a potential 44% improvement brought on by effective channeling. In comparison, the cataract (ophthalmologists) and hip replacement (orthopedic surgeons) surgeries reflected 19% and 14% improvements, respectively.

5.2 *Design Phases*

Building on the improvement potential found in the discussed diagnosis phase, the research moved into the design phase. The pilot run of the α -design was conducted in the second half of 2018. Table 4 shows the potential improvements per the 1st iteration phase and compares the actual information of the first six months' pre-artifact results with second six months' post-artifact information.

As indicated in Table 4, the actual channeling results per the pdf-based framework (as a developmental artifact) offer an admirable referral

Table 4 α -design: Initial improvement expectations

<i>Procedure</i>	<i>Avg cost (pre-artifact)</i>	<i>Avg cost (post-artifact)</i>	<i>Avg saving per procedure</i>	<i>Savings percentage</i>
Hip replacement surgery	R 154 607	R 137 449	R 17 158	11.10
Cesarean section	R 43 448	R 42 566	R 882	2.05
Cataract procedures	R 26 246	R 24 596	R 1 650	6.29

channeling effect to better-ranked medical service providers. Hip replacement surgery, as the most expensive service, returned an improvement of around 11%, with cesarean sections had returning the lowest improvement of just over 2%, while cataract procedures returned an improvement of 6.29%. The contrast in benefits results to gynecologist referral per the diagnosis phase could be explained by a notion that women develop more personal relationships with their healthcare provider and are probably less likely to change.

The β -design refined the problem and revisited some aspects within the framework, resulting in broader stakeholder inclusiveness and realistic channeling results. The β -design was initially tested in the first six months of 2019 and compared to the results for the last six months of 2018. The summative results for all procedures are provided below.

Table 5 indicates the better-ranked medical services providers before and after the digital artifact implementation, resulting in an average improvement of 52%. These more detailed cost-saving effects in channeling to better-ranked service providers are illustrated below.

Figure 5 illustrates the summative results throughout the artifact development process as follows:

Table 5 β -design: Initial improvements

<i>Procedure</i>	<i>Avg cost (pre-artifact)</i>	<i>Avg cost (post-artifact)</i>	<i>Avg saving per procedure</i>	<i>Savings percentage</i>
All procedures	R 44 729	R 42 453	R 2 276	5.09

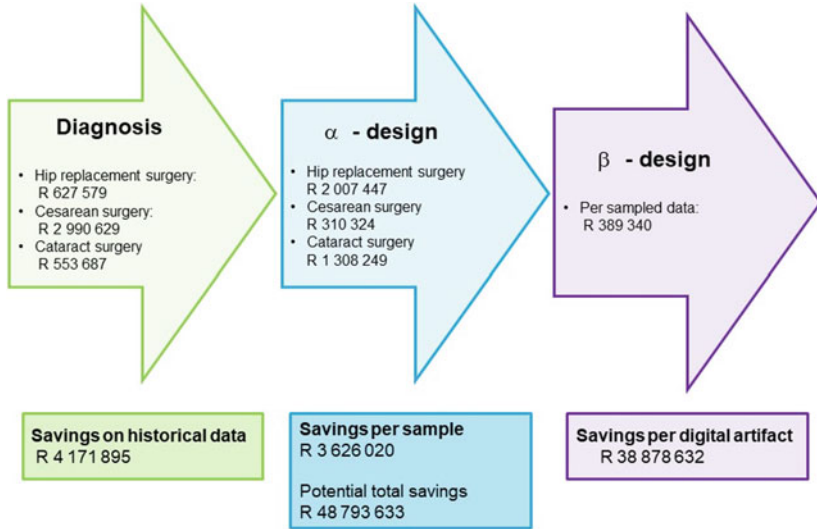


Fig. 5 Conceptual and actual savings due to effective channeling

- Diagnosis:** This phase evaluated historical data over 12 months by applying the conceptual channeling principle, assuming that members could have been channeled to a better-ranked service provider. A potential cost saving of R 4 171 895¹ for the period was calculated.
- α -design:** This phase's analysis was based on actual referrals via the pilot implementation of the developmental artifact at a sample of 20 GP's practices, which resulted in a substantial saving of R 3 626 020. Extrapolating the results to all procedures performed to all the GPs within the medical scheme's network could have led to a potential cost saving of R 48 793 633.
- β -design:** Similarly, the initial evaluation of the refined, *digital* artifact was initially based on actual referral data of a sample size of 20 GPs, which returned savings of R 489 340, which, extrapolated to all procedure costs for the scheme, could have resulted in savings of R 38 878 632.

¹ "R" denotes South African Rand, as the local currency.

The actuarial consultants confirmed the above results, and the effective operation of the artifact was validated by the schemes management and relevant service provider consultants.

6 RESEARCH EVIDENCE

A key objective of this study was to develop a solution for the real-life business problem facing medical schemes in South Africa. In the case study organization context, the researcher had access to provider profiling and benchmarking information to rank providers. Based on international standards, such information was based on medical service provider profiling information, developed by actuaries (as one of the stakeholder classes). Furthermore, actual claims data were used to calculate the cost per case and compare the cost efficiencies of the different healthcare providers.

Several secondary objectives were identified to develop a provider network channeling referral system for medical schemes in SA. Firstly, utilizing the eADR approach, a diagnostic phase evaluated the current business scenario to define how a DSP network and appropriate network channeling can benefit all legitimate stakeholders. Secondly, through two iterations of design phases, the analysis of historical data supported the development of subsequent artifacts (α -design and β -design). The frameworks essentially resulted in *sophisticated referral lists*, guiding the channeling of members toward better-ranked specialists without any discomfort or restriction of choice for the member. Within these frameworks, the data analysis indicated substantial financial impact, indicating the possible cost savings a network channeling framework might have.

Based on the foundation of stakeholder theory, the skills and expertise of legitimate stakeholders were used to define the problem and to develop and validate the results. Several stakeholder classes were identified, including medical services providers, consultants, organizational management, and actuaries.

7 RESEARCH CONCLUSION

In terms of the research methodology, the pragmatism framework provided the requisite paradigm in context, which was set in an experienced business problem within a medical scheme service provider. The nature of eADR's iterative cycles, encompassing both academic and

industry practitioners, enabled the design and development of a useable artifact. The provider profiling information was used to rank service providers and create an artifact that can be used for member channeling toward the better-ranked providers.

While different artifacts were made during the various stages of design in the research process, all resulted in significant cost savings for the medical scheme, better quality healthcare through shorter hospital stay, fewer readmissions for members, and more patients for the services provider. Ultimately, it can be argued that the research process culminated in a solution that benefited the stakeholders in context.

8 CONCLUDING REMARKS ON THE RESEARCH PROCESS

The South African healthcare setting is a complex one, even more so if one considers the medical scheme environment, where the government and paid contributions provide little support and must be managed so that healthcare is affordable, sustainable, and of high-quality.

The eADR process provided guidance and research structure in developing the envisaged solution within a business setting. Its iterative cycles provided the roadmap in which the various research and stakeholder engagement activities could be effectively executed.

Due to the complexity of the medical procedural codes, different service providers and provider classes, and costs associated with each medical procedure, only three procedures were selected for this study. While these indicated substantial cost savings, it must be noted that these specific findings are only linked to these procedures. Further roll-out and evaluations in other medical disciplines and procedures may be required.

Disclosure Statement This chapter is derived from the following research project: Ward, E. C. (2021). *Developing a channeling framework for healthcare service provider networks for a medical scheme in South Africa* (Ph.D. thesis). North-West University.

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Synthesis and Evaluation of Engineering Processes for the Development of Airborne Electronic Equipment

Johann Holm  and *Danie Viljoen* 

1 INTRODUCTION

Electronic equipment has been applied in flight vehicles as a component of controllable powered flight. This type of equipment is employed to assist flight crew in the execution of their duties and to ensure the mission capability of the flight vehicle in which these devices and systems are installed (Viljoen, 2016).

The development of airborne equipment is characterized by complexity for different reasons, most notably including its technical complexity, legislative constraints, and the associated project environment. Specifically, electronic equipment used on board aircraft has to meet airworthiness requirements and standards. Electronic equipment is critically important

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to measure and control the behavior of a flight vehicle and must be fully defined and highly reliable. In addition, airworthiness requires confidence that all equipment that constitutes a flight vehicle is functionally capable and safe to operate.

The objective of this research was to establish a framework for developing airborne electronic equipment that is bespoke, accepted by relevant role players, and effective in terms of its methodology and application of development resources. The research was done within a highly controlled procurement environment with various stakeholder types and complex external and internal organizational interfaces.

The pragmatic nature of the research challenge required an equally pragmatic research philosophy and associated methods:

- Design Science Research (DSR) was identified as a suitable research paradigm as it supports translation between real-world challenges and theoretical research while allowing results from academic research to be incorporated back into the real world in the form of artifacts (Hevner, 2004);
- Action Design Research (ADR) was applied since the research was being conducted while artifacts from DSR were being introduced, and reflection was required at different research points to ensure the rigor of theories and artifacts (Sein et al., 2011);
- Since the research was being done in parallel with the development company's systems engineering (SE) processes, alignment was required between academic research and real-world development requirements and objectives. This alignment was provided by Quality Research Management (QRM) (Holm & van der Merwe, 2019b).

This research was qualitative as the focus was on processes, procedures, and methods which were used to inform the design of a robust development framework for airborne electronic equipment. Formal review points along the way allowed the researchers to critically evaluate, learn, and adapt during the creative process by doing reflection. This research project spanned several years and studies, and the value of critical reviews as done by colleagues and peers was confirmed with a formal review by a committee of experts. The final validation of the development framework was evidenced by the acceptance and implementation of the final artifact by the company and defense procurement agency.

2 BACKGROUND OF THE STUDY

The development of airborne electronic equipment is a particularly challenging task (Viljoen, 2016). This is because the inherent nature of electronic equipment differs from, for example, mechanical equipment, and the project process that is followed to acquire electronic equipment is unique. However, the process followed by the client's procurement agency at the time did not cater for this singularity, and a more modern development process had to be devised to replace the restrictive, tedious, and often costly development process.

Therefore, the research project aimed to research, develop, and propose an alternative development framework inside a highly regulated and controlled environment. The framework had to consider the inherent nature of development activities and regulatory requirements to provide an effective solution, including processes, constraints, and enablers, for the development of airborne electronic equipment.

Understanding the context of a highly controlled environment is vital to elaborate on the research problem. Meticulous control and evaluation of system design data and engineering, manufacturing, and installation processes are required to ensure basic functionality, while support processes include operating instructions, procedures, and maintenance. Evidence must be provided throughout the development process that responsible processes were followed and that all quality assurance and control were done to deliver a safe end-product of high quality.

Baselines are defined to reflect the configuration of an aircraft at any point during its development, deployment, operation, and maintenance. Therefore, it is critical to ensure the integrity of an aircraft's configuration by ensuring a set of records is kept on requirements, technical decisions, implementation details, as well as validation and verification (also known as test and evaluation) results. The method to ensure the availability and integrity of all data relating to an aircraft's status, and associated changes, is referred to as configuration management. An example of a basic system architecture is shown in Fig. 1.

All deviations from an established (certified) baseline, such as technical and other updates or modifications of any element on the aircraft, are rigorously controlled. Relevant to airborne electronic equipment, the introduction of digital computers resulted in functionally versatile equipment and additional complexity that introduced highly specialized development, operational, support, and maintenance efforts. This technical

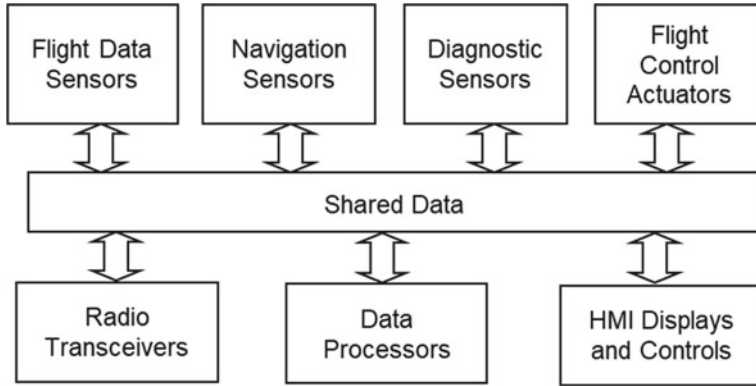


Fig. 1 An integrated avionics system

complexity, combined with the complexity of the project environment, resulted in challenges that had to be addressed.

Historically, the development company—Denel Aviation—had been involved in the manufacturing of flight vehicles, including airframes, engines, gearboxes, and electronic systems. The procurement agency (Armcor) initially utilized military standards for contract management, most notably MIL-STD-490A for specification standards (MIL-STD-490A, 1985), RSA-MIL-STD-3 and MIL-STD-1521B for technical reviews and audits (RSA-MIL-STD-3, revised 2004; MIL-STD-1521B, 1976)—used to define agreements and review milestones.

Specifically, software development was done according to military standard MIL-STD-498 (MIL-STD-498, 1994). These standards were not aligned with contemporary airworthiness, software and systems engineering standards and recommended practices, although the military airworthiness board advised the use of the latter. A particular aspect of the contemporary recommended practice standards is that they outline “what” should be done and do not elaborate on the “how.” The military standards, on the contrary, were very prescriptive in terms of methods to be followed.

Prior projects had been extensively analyzed before the definition of this research project, which provided information to define requirements for the development of the new framework (Viljoen, 2008, 2016).

Evidently, the environment inside which a new framework had to be researched and developed was constrained by regulatory controls, established legacy processes, and a procurement agency that had invested in legacy standards. As a result, the research had to be comprehensive, and of high integrity, it had to refer to reliable sources as inputs to the research process, and all associated changes had to be done slowly and inclusively as part of a change management process. Due to the critical safety requirement, the new framework (as an artifact) was also diligently scrutinized and criticized, activities that were welcomed as elements of reflection during the research process.

3 RESEARCH PROBLEM AND OBJECTIVES

The following analysis provides context to the research problem and its derived objectives (Viljoen, 2016). The QRM method requires research challenges to be defined below.

Denel's development environment, encapsulated by the procurement agency's environment, was following a "template" approach to system development. As a result, the context of airborne electronic equipment had to be rationalized to motivate the reason for improvement:

Challenge 1: The scope of engineering activities for the development of airborne electronic equipment was not pertinently established.

Qualification and airworthiness requirements, conditions imposed by the procurement agency, test and integration constraints, and recommended aerospace industry practices were not all clear before project planning. The resulting difficulties and inefficiencies were evident in project execution, which was traced back to the following challenge:

Challenge 2: There was a lack of clear definition of activities and tasks for the development of platform-specific airborne electronic systems.

It became evident from active participation in previous development projects that the lack of applicable development processes hampered the development of a "first article." On one side of the spectrum, there was a requirement for rapid development (using prototypes, for example), while the opposite side required a structured, controlled development process that was characterized by clear definition and comprehensive life cycle data to meet the requirements of airworthiness. Therefore:

Challenge 3: An appropriate life cycle model for developing airborne electronic equipment, particularly addressing the nonlinear requirement of incremental improvement from information feedback, was not available.

Finally, controls that act on a development process are used to meet all functional and non-functional requirements. Controls act on engineering activities by using an appropriate mechanism to ensure correct execution and outcomes from activities. With a nonlinear approach, development can occur without generating and documenting decisions and change, requiring a specific control focus. As a result, from previous development projects, the following challenge was identified:

Challenge 4: It was determined that process control mechanisms were ineffective and had to be reviewed and improved to meet the requirements of the new framework.

From the above challenges, the main research challenge of this study was validated, as follows:

Main research challenge: *To synthesize and validate a process to ensure the cost-effective development of platform-specific airborne electronic equipment in the South African industrial and military environment.*

The research objectives, defined to meet the research challenges above, are defined as follows:

- A process context was to be clearly defined for airborne electronic equipment;
- Generic activities and tasks required for the development of airborne electronic equipment had to be identified;
- An appropriate lifecycle model for the development of airborne electronic equipment had to be defined and created;
- Suitable development control mechanisms needed to be identified and put in place.

Constraints were present as is customary in any development environment. In this research project, the following had to be addressed:

- The requirement for the development of airworthy electronic equipment had to include all elements of safety and reliability;
- The procurement agency's contract requirements still had to be met, and the new framework had to be "fit for purpose" in this context;
- Legacy processes still had a place in the development of the overall system, and the new framework had to consider these interdependencies.

4 RESEARCH DESIGN

Figure 2 shows the Design Science Research (DSR) paradigm specific to developing a framework for developing airborne electronic equipment (Goldkuhl, 2011). The relevance cycle was used to ensure all real-world requirements for the new development framework were validated and available before the design process commenced.

From the rigor cycle, a theoretical method could be developed from qualitative meta-analyses of existing standards and methods while adding new knowledge to the existing knowledge base (Gregor & Hevner, 2013; Hammond & Wellington, 2013). The design cycle was used to ensure the selected and created processes, procedures and methods were evaluated and fit for purpose in terms of solutions meeting requirements (Hevner, 2007; Holm & van der Merwe, 2019a). Final validation was achieved when the produced artifact was evaluated and accepted by the development company and the procurement agency. It was important to ensure requirements were validated before the design process started to minimize iterative development efforts (preventing the need to revise input requirements that would affect all design activities downstream).

The DSR paradigm was ideally suited to this research, although its original application was in the information technology environment. Real-world requirements could be translated to a set of design requirements for the new framework. Additional requirements and theoretical inputs were obtained from translating existing standards to abstracted versions, adjusting abstracted theories to meet objectives, and then reintegrating solutions back into a relevant new framework (Gregor & Hevner, 2013).

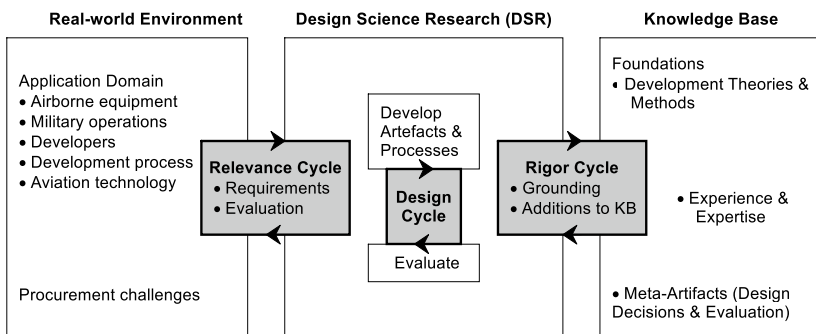


Fig. 2 DSR in this research paradigm (Source Adapted from Hevner [2007])

4.1 *Research Philosophy*

A pragmatic philosophy was identified due to the applied nature of the research (Goldkuhl, 2011; Kivunja & Kuyini, 2017). Theoretical results had to be converted to an actual, workable solution without sacrificing any integrity or value. Instead, value could be added by adding desirable characteristics such as speed of execution and effective application of development resources.

At the onset of this research, the existence of a reference method for airborne electronic equipment development provided a good means to learn from history by way of reflection. It was also possible to maintain the interfaces between electronic development teams and the larger multidisciplinary development teams by referencing legacy methods. New knowledge was created from performing an abstraction of existing standards, legacy methods, and modern methods, after which a solution could be constructed and defined in detail. The critical evaluation of all methods in their most basic form allowed the researcher to leave behind recorded design decisions that will add significant value when future revisions are done.

4.2 *Research Approach*

Starting with a reference development framework (as a theory) was important as it added an element of deductive confidence to the new framework. By researching different legacy and modern development processes and performing abstractions, the deductive method became highly valuable as it highlighted several fundamental differences between current and prior development philosophies. These differences, in turn, were critically evaluated to result in the underlying philosophy of the new framework—this included an element of inductive reasoning as the philosophies had to be creatively combined and adjusted to meet research objectives. Overall, the deductive component was significantly stronger than its inductive counterpart (Hammond & Wellington, 2013).

This research was qualitative as the design process was informed by research from an archival analysis, experience, and legacy process information at the time. Importantly, the qualitative research referred to experience and success/failure analyses from prior projects in this environment.

4.3 *Research Strategy*

Research Methods

Inside the DSR paradigm, the research methods employed in this study are as follows:

- Archival research:

Case studies: Different cases from prior projects were analyzed during this research project (Yin, 2014). Prior projects were all conducted in the same environment, making results from their analyses highly relevant to the research for a new framework. Specifically, data were available from projects as early as 1986 (in the Atlas Aircraft Corporation that later became Denel Aviation) up to 2006, when the project started. A retrospective analysis was done on development projects, with the aim of identifying process shortfalls to be addressed in the new framework. A research project that immediately preceded this research project (2006–2010) produced an artifact called Airborne Electronic Systems Development Process (AEDSP) as a precursor to the new framework;

Literature study: A comprehensive study was done on existing standards and modern systems engineering development processes (Viljoen, 2016). These were used to derive a more relevant development philosophy and to align the legacy processes with proven accepted development methods. A wealth of literature exists on development processes, but not many apply to this specific environment, hence the need existed for a comprehensive study, followed by in-depth analyses of different development paradigms;

- *Action Design Research (ADR):* The researcher acted as a development engineer during the execution project of this project and was thus also a participant in the research project (Sein et al., 2011). Since the practice-inspired research was done while active research was being conducted, the research took on the form of participant action (design) research (PADR). A number of reflection points were identified (retrospectively) during the study to ensure results were objectively and critically assessed before proceeding with a following research project phase. As is common with ADR, the practical situation was inseparable from its context, the artifact was ingrained by theory, and reciprocal shaping was evident in the emergence of both the theory and artifact (Pettersson & Lundberg, 2016). It is also

important to note that the theory, derived from the in-depth literature analysis, resulted in a generalized process model that could be applied across different layers of the new framework. This enabled the researcher to develop detailed processes from the process model;

- *Quality Research Management (QRM)*: The research project was aligned with the client's requirements and expected outcomes by using QRM. Research challenges and objectives of this research were clearly defined and informed by directed literature studies on identified research topics. Research solutions address the challenges in a traceable manner and research verification was achieved by showing how each research challenge was converted to a solution in a systematic way, as defined by QRM. Overall research validation was simplified by using a research validation matrix (RVM) that provided a visual representation of the problem verification, literature analysis, and solution validation. By following this method, the researcher was able to focus research effort and optimally plan research project execution and quality.

Research Process

This research was conducted as a longitudinal study, and the process for research and development of the new framework followed an evolutionary path, as outlined below:

- Development of different airborne equipment was conducted over a period from 1986 to 2006, including automated flight control systems (AFCS), mission planning system software, and multi-function display systems;
- In 2006, a development process improvement program was initiated at Denel, which was addressed by development of the Airborne Systems Development Process (AEDSP) to produce a process model:
 - The research was conducted as part of a Masters study in conjunction with industry specialists (Viljoen, 2008);
 - A navigation system for the Oryx helicopter was developed using detailed processes from the AEDSP, and shortcomings of the process were identified;
 - A reflection point was defined at this time, and a detailed review of the existing process was completed before the latest study commenced.

- The requirements for a modern development framework were defined and research and development of the new framework had been conducted between 2010 and 2014:
 - Historic development cases were revisited to clearly define the environment inside which the new framework would be employed;
 - Existing standards were analyzed in depth and a significant effort was made to perform abstraction of proven development philosophies;
 - Modern development methods were analyzed, and insights were gained from the experience of numerous authors that contributed to these methods;
 - As part of a development team, the researcher had access to specialists in the research environment that contributed to the framework definition;
 - A philosophy was defined for the theoretical process model after a major reflection point, with reciprocal shaping between the artifact and the underlying theoretical model;
 - After further research and reflection, process controls and enablers were defined in detail and used to provide clear guidelines for the new framework to be pragmatic. This further enhanced the theoretical process model.

The time diagram (Fig. 3) shows the evolution of the final artifact as a detailed development framework.

5 DATA, DATA COLLECTION, AND ANALYSIS

All data were acquired from case studies and literature studies using a longitudinal collection method. Evolution of the new framework was a consequence of the research and development nature of this research, with reflection points aligned with client milestones and research review milestones (Van Alstyne & Logan, 2007). Colloquiums were used as formal milestones and were found to be highly instructive as reflection opportunities (including critical evaluation of successes and failures, abstraction of real-world knowledge to theoretical knowledge base, and rectifications and improvements where possible).

The final artifact emerged over time, with data (results and analyses) from prior artifacts, literature analyses, case study analyses, and expert

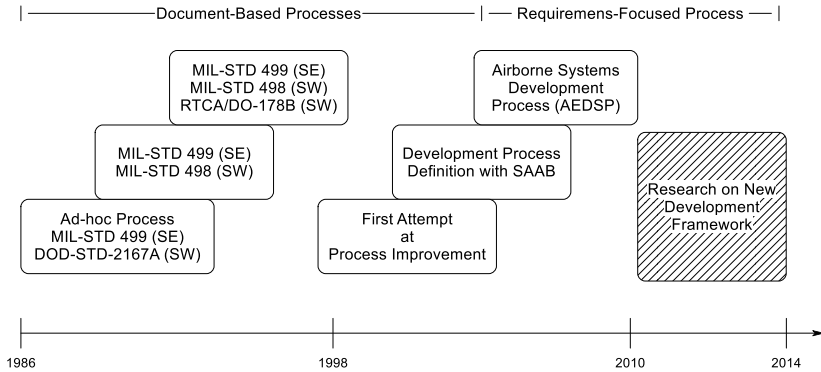


Fig. 3 Evolution of development framework

input used to improve artifacts in an iterative way. During this development, the true value of reflection became evident, as confirmed by more recent research on ADR and the value of reflection (Petersson & Lundberg, 2016).

The research data collection method can also be seen as an iterative and incremental collection process during which reflection was used to formally integrate historical learnings into the next iteration's artifact requirements and constraints (i.e., reciprocal shaping took place). That is, data were obtained from historical analysis in a constructivist manner, and the creation of knowledge was thus also evolutionary (emergent). In many instances, results from prior cases and observations could not have been predicted beforehand, and a prototype artifact had to be implemented and tested before knowledge could become available. Interestingly, iterative and incremental development (IID) of prototypes is thus a method highly suited to ADR research and artifact development (Larman & Basili, 2003).

Technological evolution alongside the research and development process indicated that the artifact will still evolve as the environment changes due to the inseparable nature of the practical situation and its context. This means that, as modeling methods become more advanced and representative, the risk associated with development is reduced since

unknown outcomes are reduced. Changes in the environment should thus reduce the complexity of the new framework in the future.

Real-World Data from Historical Case Studies

Data from development projects before this research provided valuable insights into the development environment and the required characteristics of the new framework. Important references, that served as baselines for the projects up to 1998, included military standards MIL-STD-499 (MIL-STD-499A, 1974) as a reference for systems engineering processes and DOD-STD-2167A (DOD-STD-2167A, 1988) for software development. These sources were not fully harmonized with the environment at the time and indicated the need for more relevant organizational standards.

RTCA/DO-178B (RTCA/DO-178B, 1992) was essential as a reference source as it provided the basis for software certification, which is a vital requirement in this highly controlled environment. Certification is based on evidence that the developed software for safety-critical systems addresses requirements (referred to as guidelines in the standard but implemented as requirements). MIL-STD-498 (MIL-STD-498, 1994) replaced DOD-STD-2167A in 1994 and since became the requirements reference for software development and documentation.

The following findings were made from the analyses of development project on a case-by-case basis, with a summary of all findings below:

- Development strategy/process:
 - An inappropriate development strategy became evident from the analyses. The strategy had no formally documented scheme to describe all necessary activities essential to the development of a certified system;
 - There was no suitable control mechanism to ensure correct execution of defined engineering activities, even if these definitions had existed;
 - Alignment between the procurement agency (Armcor) and the development contractor (Denel) was difficult due to lack of support for “first article” development methods.

- Software development:
 - Software development does not follow the same approach as for hardware, and the iterative nature of software development was not reflected in historical methods;
 - The historical development process limited effective development as it was based on a sequential (linear) development process, as opposed to the rapid prototyping to produce a “first article,” as was seen in commercial off-the-shelf developments (COTS).
- Certification:
 - The lack of an appropriate process and detailed activities resulted in the lack of certification (life cycle) data. Therefore, it was not possible to define and manage the development process appropriately at the onset;
 - Embedded software, specifically, required an appropriate life cycle model for its development—this was not available from existing processes.
- Configuration and change management:
 - The management of life cycle configuration and change was ineffective and caused inefficiencies and certification (acceptance) challenges;
 - A suitable baseline control mechanism was not available, which resulted in inefficient configuration and change control.

From the above analyses, the research challenges listed in Sect. 3 were identified and addressed. The fundamental finding was that the philosophical differences between historical and modern strategies, as implemented by processes down the line, resulted in a development process model that was ineffective and inefficient at the time.

Academic Literature on Development Processes

A detailed content analysis was done on literature on development methods. The data used in this study included, most notably, the following references and findings from their detailed analyses:

- **“Classical” systems engineering references** such as MIL-STD-490A (MIL-STD-490A, 1985), MIL-STD-1521B (MIL-STD-1521B, 1976), MIL-STD-498 (MIL-STD-498, 1994), and MIL-STD-3 (RSA-MIL-STD-3, 2004):
 - Processes were document-based and very prescriptive. The standards were not compatible with modern requirements management systems;
 - A different approach was followed to the life cycle at each level of the system hierarchy, including the document types at each level;
 - A set of predefined milestones and review points resulted in linear process that was not applicable to modern software development processes;
 - The difference between project management and technical processes and their tasks was unclear, complicating the engineering and management efforts.
- **Modern (contemporary) systems engineering references**, including ISO/IEC 15288 (ISO/IEC 15288, 2008), IEEE 1220 (IEEE 1220, 2005), EIA 632 (ANSI/EIA-632, 1999), and IEEE 12207 (ISO/IEC/IEEE 12207, 2007):
 - Methods are defined at a lower level, which allows a process designer the freedom to construct the most suitable high-level process;
 - The hierarchy is fractal in nature, allowing a systems-of-system approach across system layers, which is beneficial for iterative use of generic models;
 - A “first article” is defined from the onset, which removes the tedious and restrictive, highly linear process;
 - Engineering and project management activities are separated, which significantly simplifies the definition of the development process.
- **Aerospace industry recommended practices**, consisting of RTCA/DO-178C (RTCA/DO-178C, 2011), RTCA/DO-254 (RTCA/DO-254, 2000), and ARP4761 (SAE/ARP4761, 1996):
 - A clear development process (and methods) must be available for the system full life cycle;

- A comprehensive safety program must be in place, including all development and related activities;
 - A requirements management process must be used, supporting the complete requirements life cycle;
 - Validation of all requirements must be done to ensure requirements as correct and comprehensive;
 - Processes and associated verification criteria must be applied to show that an instantiation of a system satisfies its requirements;
 - A configuration management system must be used to ensure a system and its elements are fully defined and all changes managed;
 - An assurance process must ensure that all defined practices and procedures are followed for system development;
 - The process and methods which are used must lead to a certified system by using a certification process and methods.
- **Academic literature** includes the INCOSE Systems Engineering Handbook (Walden et al., 2015), the Agile Manifesto (Beck et al., 2001), Larman and Basili (Larman & Basili, 2003), Royce (Royce, 1970), and Estefan (Estefan, 2008):
 - Two fundamental approaches are followed, namely (i) planned and structured vs (ii) unplanned and organic;
 - Planned approaches specify the development process and requirements for the system development (acquisition) phase;
 - The focus is on requirements traceability, verification and validation, and comprehensiveness;
 - Airborne system development can benefit from an evolutionary approach such as iterative and incremental development (IID);
 - IID provides two options, namely, to continuously develop "blocks" of functionality or to develop in ring-fenced blocks, both of which apply;
 - Airborne electronic equipment should be developed with pre-specified requirements in a multi-step process.

Findings from the qualitative meta-analyses were used to derive a process model that was used as a blueprint for detailed processes across the hierarchy. Specifically, an in-depth analysis of the RTCA/DO-178C (RTCA/DO-178C, 2011) standard in combination with the IDEF-0

definition (Systems Management College, 2001) resulted in the definition of a core development process (philosophy) that was applied across layers of the system hierarchy. The fundamental difference in the approach is that there must be sufficient evidence that all safety-related errors had been detected and removed for complex software and hardware elements. With this approach, prototypes are developed and tested in an IID manner, and errors are detected early. This is different from attempting to model all potential outcomes (predict) only to delay actual system verification testing until later stages.

6 RESEARCH EVIDENCE

The diagram below shows the results of the iterative analysis and synthesis research process, which is the life cycle model that forms the basis of the development philosophy. This model can be applied fractally, which means that this model can apply to different layers of the system hierarchy.

In Fig. 4 above, the fundamental life cycle model is shown in generic form, including requirements, synthesis, verification, and the associated controls and enablers:

- Requirements processes are used to determine functional and performance requirements, non-functional requirements, and constraints;

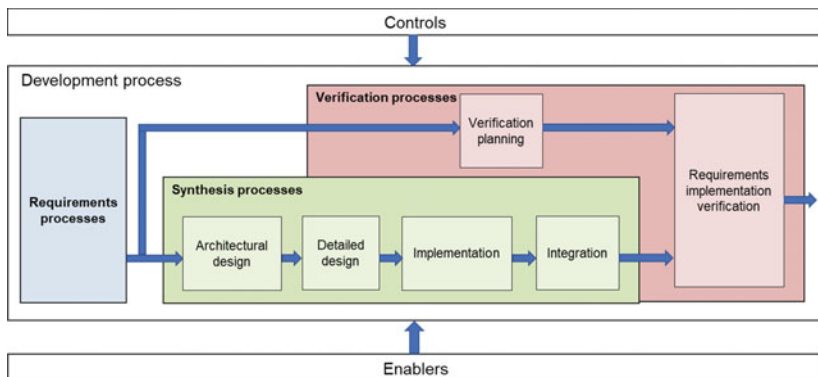


Fig. 4 High-level life cycle process model as derived from the RTCA/DO-178C analysis

- Synthesis processes are used to implement requirements and follow a standard detail design process model;
- Verification processes ensure all implemented functions meet requirements by producing objective evidence, also to be used for certification;
- Controls include configuration (change) management and quality assurance processes that validate requirements and development functions;
- Enablers include (again) configuration management such as record management, design methods, tools for design and implementation, technical plans, and prototyping.

Safety assurance is done as part of the system development process, with specific attention to:

- Functional hazard assessment where system functions are systematically analyzed to determine consequences of failures (resource failures that lead to functional failures), often in the form of a failure mode effect and criticality analysis (FMECA);
- Preliminary system safety assessment that ensures sufficient redundancy is present in the architecture and that development assurance levels are in line with safety objectives;
- System safety assessment that ensures all system safety requirements have been met.

The combination of the life cycle model philosophy with safety requirements leads to a system-level development process model that embodies the derived philosophy in the form of a realizable artifact (Fig. 5).

Lower-level models represent the core process model regarding requirements definition, synthesis, and verification (Viljoen, 2016).

Validation of the model was obtained using a review committee. In addition, validation was presented using a Research Validation Matrix, as in Table 1.

The final artifact, namely the fully defined development framework (including detailed processes), was published as an Engineering Manual and formally accepted into the Denel Quality Management System. For the Engineering Manual to be accepted, a review process was followed and subjected to similarly stringent requirements of a software review.

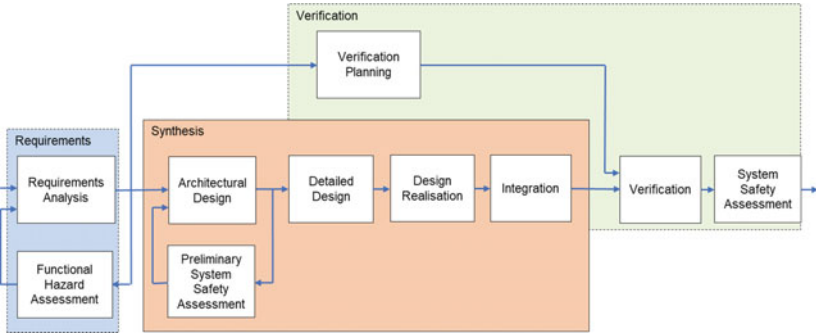


Fig. 5 System-level development process model

Qualified independent panel members were used in the process with their roles as follows:

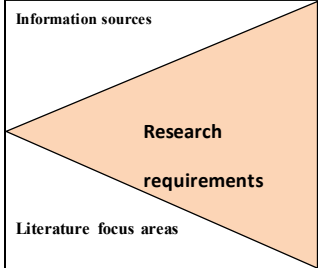
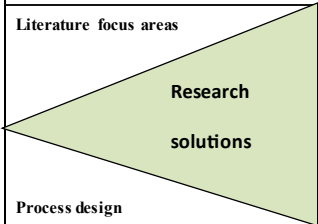
- Inspection leader—planning and leading the review;
- Reviewers representing the following specialties:
 - Systems engineering;
 - System safety;
 - Quality assurance;
 - Software qualification;
 - Reliability, availability, and maintainability (RAM);
 - System qualification;
 - Software quality engineering;
 - Airworthiness and certification.

The research added a significant form of validation to the final artifact as a product to Denel (and Armscor) in the form of a PhD document (Viljoen, 2016), substantiated by using research validation of the problem, literature, and solution areas (as demonstrated in Table 1).

7 RESEARCH CONCLUSION

The primary research objective of this study was to synthesize and validate a process to ensure cost-effective development of platform-specific airborne electronic equipment in the South African industrial and military environment. This was achieved by designing a new framework that

Table 1 Research Validation Matrix for this study

Observations from case study 1 - AFCS	↓	↓	↓	↓
Observations from case study 2 - Navigation system			↓	
Retrospective assessment of case studies / prior study		↓		
 <p>Research requirements</p> <p>Literature focus areas</p>	The scope of the engineering process for the development of airborne electronic equipment is not pertinently established.	The activities and tasks required for the development of platform-specific airborne electronic systems are not identified explicitly.	A lifecycle model suitable for the development of airborne electronic equipment, in particular resolving the problem of information feedback, is not determined.	The development process control mechanisms are ineffective.
Classical systems engineering standards	↑	↑	↑ ↓	↑
Contemporary systems engineering standards	↑	↑ ↓	↑ ↓	↑
Quality management standards	↑	↓		↓
Configuration management standards				↑ ↓
Airworthiness recommended practices	↑ ↓	↓		
Life cycle models described in academic literature			↑ ↓	
 <p>Research solutions</p> <p>Process design</p>	Establish a definition of the scope of the development process	Identify the tasks required for the development of airborne electronic equipment	Develop and validate an appropriate life cycle model	Define process control mechanisms
Detailed contextualization	↑			↑
Development of process framework			↑	↑
Detailed process design		↑	↑	
Process function details		↑	↑	
Process controls	↑			↑
Process enablers	↑	↑		
Integrated process definition	↑	↑	↑	↑

encapsulated the development process based on a process model obtained from following an ADR method in a DSR paradigm.

The value of QRM was demonstrated in aligning the real-world requirements with research objectives and allowing focused research in a well-defined research project. The RVM was used to ensure the problem statement, literature study, and solution were validated and traceable.

The practice-inspired research was conducted in an environment where the practical situation could not be separated from its context. The final artifact resulting from the ADR study was based on an in-depth understanding of development methods as obtained from a qualitative meta-analysis. A process model for system and equipment development was defined from the analysis of case studies, standards, and academic literature by means of design and reflection. Reciprocal shaping between the context (airworthiness and contractual requirements) and the process model allowed the development of detailed processes at relevant layers of the development hierarchy (from system level down to component level).

Evaluation of the final model resulted in the acceptance of the artifact as a new framework for the development of platform-specific airborne electronic equipment in the real-world context. Due to its generic nature, the process model can be applied to the development of most types of safety-critical mechatronic systems and is thus not limited to airborne electronic equipment.

In a real-world research and development environment where requirements management is vital, and development effort is focused, it is necessary to align research objectives with stakeholder expectations. This is achieved using QRM and DSR, and any applicable research method that supports the development of an artifact applies. The ADR method used in this research was found to be particularly effective, with specific mention of the value of reflection and learning.

8 CONCLUDING REMARKS ON THE RESEARCH PROCESS

No significant resistance toward the change to a new development paradigm was encountered, as most stakeholders appreciated the fact that the engineering process had to be adapted to accommodate the guidelines from contemporary engineering standards. The core focus of this research was to develop a new development framework. Useful input was provided by co-workers and colleagues at the South African Airforce and Armscor as part of the learning and reflection activities.

The fact that the activity of re-engineering parts of the product realization component, within the Denel Aviation quality management system, was associated with an academic research project ensured that all the design decisions regarding the new process were convincingly substantiated.

Contemporary systems engineering-related standards do not prescribe the methods by which their requirements must be met. A considerable challenge in synthesizing engineering processes (detailed process descriptions) was to develop procedures and work instructions that described the methods by which the standards would achieve the requirements. That is, reciprocal shaping was used to produce detailed processes from generic models. The bulk of these procedures and work instructions, referenced by the framework developed during the study, were prepared by co-workers at Denel Aviation, adding aspects of their own expertise and experience.

Disclosure Statement This article is derived from the following PhD thesis: Viljoen, D. A. (2016). Synthesis and evaluation of engineering processes for the development of airborne electronic equipment (PhD thesis, North-West University).

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The Development of a Growth-Strategy Support Model to Enable Cross-Border Expansion Stratagems

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1 BACKGROUND

As companies mature in their markets, growth often stagnates, and new marketplaces may need to be found. As the world becomes more accessible, growing an organization across national borders can become a complicated process involving social change across multiple dimensions, including politics, economy, communications, culture, and the physical environment. It is fair to reason that such growth strategies open the organization to certain levels of risk. For an organization to proactively identify and mitigate the risks will require in-depth research of the targeted markets. This presents the research problem for this study,

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namely that of organizational growth strategies in unchartered, potentially risky, cross-border environments. Therefore, the research objective of this study was to develop a growth-strategy support model (GSSM) to inform and support cross-border expansion initiatives.

In addressing this mentioned business problem, the (practical) research method utilized an elaborated action design research (eADR) approach, which aims to develop design knowledge by emergent artifact creation. Even though the primary research method is *qualitative*, with information obtained from structured interviews and literature analysis pertinent to the study, the GSSM aims to rank the various market environment aspects and *quantify* the attractiveness of the targeted territory. As such, the research encompassed three stages, namely:

- Properly understand and define the experienced business problem.
- Design and pilot a 1st iteration proof-of-concept strategy support model.
- Refine and validate the 2nd iteration strategy support model.

Even though some empirical findings are presented to illustrate the suggested artifact, the critical objective of this chapter is to elucidate the selected research approach's application and the researcher's experiences.

2 INTRODUCTION TO THE STUDY

Since no organization has unlimited resources to support growth and expansion strategies, meticulous planning is required to mitigate the risks associated with incomplete knowledge of the targeted market. Such resource limitation brought about this study, which centered on the case of a global player in the heavy industries engineering field, which designs, manufactures, and distributes its products through a worldwide network of either organization-owned or independent distributor facilities. The organization aims to expand its footprint on the African continent and get more extensive representation in the various related market sectors. However, the unstable market conditions and the lack of reliable market intelligence in many African countries make this problematic. For purposes of developing the GSSM, the Southern African country of Mozambique was identified.

Across Africa, demographic shifts create meaningful business opportunities and daunting challenges (Douglas, 2012), and Mozambique is no exception. After decades of civil war, Mozambique emerged as one of the top economic growth countries in the first decade and a half of the 2000s (Macauhub, 2012; Olivenca, 2013). Following these promising times, however, the African Development Bank Group (2018) reported that the Mozambican economic growth prospects were significantly reduced due to various macro- and microeconomic, political, social, and environmental factors. Even though the Mozambican economy is currently recovering, the economic conditions remain challenging. Two major influencing factors that hamper socio-economic development include the rise of Islamic extremism in the resource-rich northern regions (Faria, 2021; Mukpo, 2021) and the impact of the recent COVID-19 pandemic (IOM, 2020).

The research objective was to develop an analytical model to support growth initiatives that will assist in formulating growth strategies for this territory. The envisaged GSSM had to determine a baseline from where to start the growth and investment cycle and guide further development while being aware of relevant stakeholders without being purely driven by financial performance objectives.

3 RESEARCH PROBLEM AND OBJECTIVES

3.1 *Introduction*

As alluded to, organizations face internal and external complexities as they expand into new markets and territories. Hevner et al. (2004) opine that such intricacies include diverse people, structures, and technologies, requiring the organization to revisit strategies and systems to align with the new environment and anticipate possible challenges.

It can be argued that an organization should reflect on its relationship with all relevant stakeholders when considering investment opportunities. Organizations are currently faced with the problem of no model or framework to support their prospective growth strategies that can capture, analyze, and rank any potential risks. This study focused on developing and evaluating the envisaged GSSM (as the *artifact*), using an eADR approach, per Gregor and Hevner's (2013) research theories.

To successfully achieve this objective, three secondary, supportive objectives were researched, as mentioned below:

- Develop a comprehensive decision-support framework that can assist as a steering framework in formulating the envisaged model.
- Develop and authenticate the developed decision-support framework and develop an *Alpha* design GSSM to serve as a proof-of-concept model.
- To enhance the mentioned proof-of-concept model, and with further acquired knowledge, refine and validate a *Beta* design version of the envisaged GSSM.

3.2 *Theoretical Foundation*

Because of the complicated nature of the Mozambican economic environment alluded to above, it was decided to approach the research problem and objectives from the perspective of two management theories, as follows:

Stakeholder theory: Organizations and their managers are responsible to the shareholders and the (broader) stakeholders (CIMA, 2015; Kessler, 2013). The following critical components of stakeholder theory were pertinent in this study:

- o **Legitimacy:** Tillema and Ter Boght (2016) and Kessler (2013) refer to legitimate (internal, external, or connected) stakeholders as those with a vested interest in its commercial activities and on whom the organization itself depends.
- o **Business ethics:** According to De Cremer (2010), Kessler (2013), and Tenbrunsel and Smith-Crowe (2008), the treatment of stakeholders is fundamental to the notion of the stakeholder theory and that actions should be judged by core rules founded on socially accepted norms of behavior.
- o **Value creation:** Even though developing a viable competitive advantage is critical (CIMA, 2015), commercial value creation should not obscure the connections between economic and social concerns (Bosse & Phillips, 2014; Porter & Kramer, 2011).

By adhering to the guidelines set by the pillars of sustainability, colloquially implied as people, planet, and profit, made famous by Elkington (1999), the organization can go a long way in embracing stakeholder theory as a business strategy.

- **Stewardship theory:** Kessler (2013) defines stewardship as a caring and loyal devotion to an organization, institution, or social group. Tillema and Ter Boght (2016) argue that stewardship is inclusive of non-economic interests and promotes the pursuit of broader cooperative behavior. The stewardship theory, therefore, suggests that any attempts to guide the agent-principal centric relationship through ethical and governance mechanism development be inclusive of all the stakeholders with a vested interest in the organization.

In context, the design and execution of the research took great pains to include stakeholders with proper understanding and empathy of the targeted region. Furthermore, because of the strategic importance of growth and expansion strategies, the envisaged GSSM was based on the well-known strategic management techniques of SWOT and PESTLE analyses, as elucidated below.

Firstly, SWOT describes the strengths, weaknesses, opportunities, and threats analyses that empower strategic considerations for the organization and entails an analytical approach to identify the internal and external factors that may affect business performances (Benzaghta et al., 2021; Bratko et al., 2021). This tool allows decision-makers to take stock of an organization's strengths and weaknesses (internal characteristics) and identify opportunities and threats (external environment).

Secondly, PESTLE describes the political, economic, sociocultural, technological, legal, environmental contexts within which the organization operates and enables the organization to see the big picture of its external environment (Mihailova, 2020; Perera, 2017). In this case, it focused on the Mozambican market environment.

Therefore, the SWOT analysis is a strategic management tool that would help the organization understand its *internal* characteristics. It should assist in assessing the *external* environment for opportunities and threats that may either contribute to or detract from the strategy formulation. Understanding both the internal and external aspects in context is crucial. For example, by understanding a specific threat in an

unknown market (such as Mozambique), it may be possible to minimize (or even nullify) its impact with internal strengths (e.g., capabilities or technologies) the organization already has. Building on especially the opportunities and threats aspects (as illustrated below), the PESTLE analysis' external focus should provide awareness of the status of critical Mozambican market-flatteners, both in terms of their present state and future trends (Fig. 1).

The SWOT and PESTLE analyses afford the strategy makers an awareness and understanding of variable factors that may impact the success of the envisaged strategy. Even though there should be an interaction between SWOT and PESTLE, strategic management is more than just knowledge. In the context of this study, *how* such strategic information was to be used in developing the GSSM was more significant.

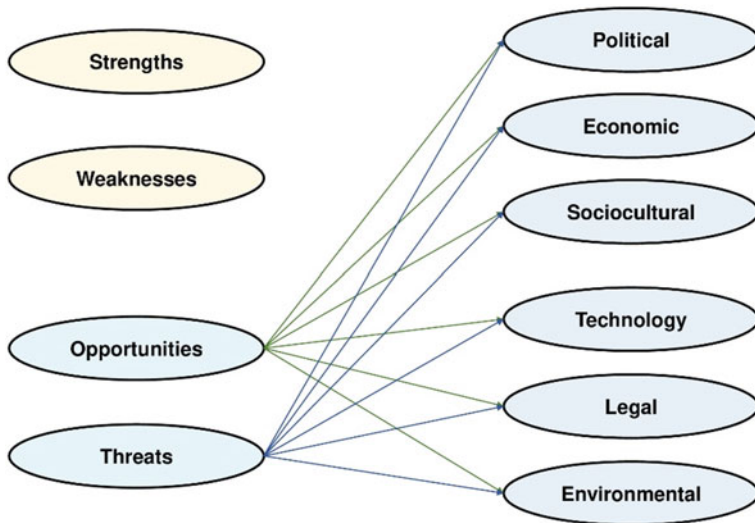


Fig. 1 SWOT and PESTLE interaction (Source Adapted from Nishada [2012])

4 RESEARCH DESIGN

4.1 Methodology

WILSON (2014) explains that research can be defined as a step-by-step process comprising collecting, recording, analyzing, and interpreting information. In context, therefore, *business research* is seen as the systematic and objective process of collecting, recording, analyzing, and interpreting data to support the solving of *managerial problems*. As indicated above, the Mozambican economic environment presents a *wicked problem* confronting organizations intending to expand their operations there. Mullarkey (2018) defines a wicked problem as one with varying requirements and constraints and complex interactions between the subcomponents of the problem and the solution, the latter of which is inherently flexible and dependent on human cognitive and social abilities.

In navigating the mentioned *wicked* scenario, the study's research methodology is based on the elements of Wilson's (2014) *honeycomb research methodology* view, as follows:

- **Research philosophy:** Deals with the beliefs about how data should be collected, analyzed, and used (Dudovskiy, 2018). When addressing a wicked problem, it is vital to deliberate the concepts of ontology, epistemology, and methodology, which respectively considers as *what we believe exists*, *how we know what we claim to know*, and *how we discover and validate such knowledge*. We note that the GSSM creation will be due to the conclusions founded on the analysis of the collected and evaluated data, and the knowledge developed during the iterative research processes.
- **Research approach:** A deductive research approach was pursued, which entails moving from the general to the specific (Woiceshyn & Daellenbach, 2018). This was accomplished by identifying risks in the Mozambican environment and then utilizing a structured interview process to refine and evaluate the micro- and macro-environmental elements that can influence the GSSM design.
- **Research strategy:** A qualitative strategy was followed, which according to Cooper and Schindler (2008), includes various interpretive techniques to describe, decode, and translate in understanding the phenomenon. This study focused on interviews with

multiple industry practitioners as the basis of research knowledge development.

- **Research design:** Seen as the blueprint for the collection, measurement, and analysis of data (Sekaran & Bougie, 2010), we distinguished between positivist, post-positivist, and realism frameworks as follows:
 - Positivist frameworks are rooted in the ontological principle that truth and reality are independent of the observer (Aliyu et al., 2014).
 - Post-positivist frameworks encompass interpretivism and require researchers to observe the world through the contributors' experiences (Thanh & Thanh, 2015).
 - Realism frameworks contain aspects of both positivism and post-positivism (Blumberg et al., 2011).

As such, the study can arguably be seen as post-positivistic. Nevertheless, it can also be argued that, due to its focus on reality, it is framed within a *realism* framework that uses accepted scientific tools in the identification, analyses, and artifact creation process while being mindful of selected contributors' personal experiences and opinions.

- **Data collection:** The *researcher-practitioner* team concept focused on the Mozambican territories in the empirical research. Primary data was obtained through structured interviews with industry participants, who were motivated by the prospect of adding to the available market intelligence regarding Mozambican knowledge. An initial group of participants was involved in the *Alpha design*, while an expanded group assisted in validating the *Beta design*.
- **Data analysis:** The empirical information obtained was used in the design of the different design iterations and diagnoses, applying an eADR approach intended to focus on critical unsolved problems in distinctive or inventive ways or address issues more efficiently effectively per Hevner et al. (2004).

4.2 Empirical Design

In this research study, the selected industry participants joined forces with academic researchers to design a practical model to support and

guide growth-strategy decisions. As a research paradigm in the context of addressing a business problem, design science (DS) seeks to extend the boundaries of organizational capabilities by developing knowledge and understanding of a problem domain and then creating new and innovative solutions to it (Hevner et al., 2004). Similarly, Iivari and Venable (2009) explain that action research (AR) has a dual goal of contributing to practice and academia while attempting to address a specific concern.

It may be argued that action design research (ADR) is an attempt to merge key aspects of DS and AR and that ADR was developed in response to a need for a research method that explicitly recognizes artifacts as ensembles emerging from design and ongoing refinement in the organization's context (Mullarkey & Hevner, 2015). Sein et al. (2011) suggest four stages in the ADR methodology, encompassing seven principles, as illustrated below (Fig. 2).

This study connected the above principles to different phases within the ADR approach, as summarized in the Table 1.

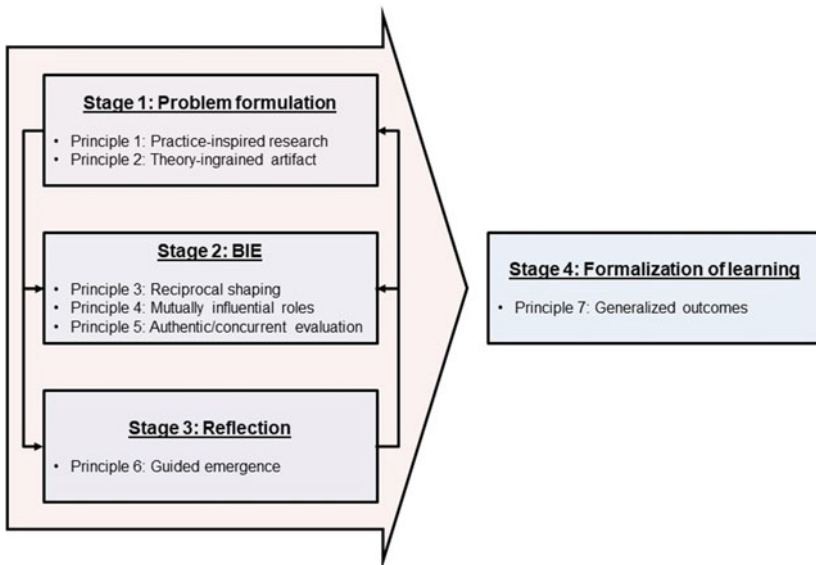


Fig. 2 ADR stages and principles (Source Adapted from Sein et al. [2011])

Table 1 Application of ADR principles

Principle 1: Practice-inspired research	According to Papp (2017), research should accentuate the viewing of field problems as knowledge-creation opportunities, thus creating a practice-inspired, functionally innovative artifact that provides new knowledge
Principle 2: Theory ingrained artifact	McCurdy et al. (2016) highlight the importance of understanding the problem and solution space
Principle 3: Reciprocal shaping	Sein et al. (2011) emphasize the inseparable influences mutually exerted by the domains of the artifact and the organizational context
Principle 4: Mutually influential roles	Petersson and Lundberg (2016) highlight the different types of knowledge the project participants bring to the table
Principle 5: Authentic and concurrent evaluation	Alexa et al. (2016) opine that authentic and concurrent evaluation is interwoven with the activities throughout the build, intervention, and evaluation (BIE) stages
Principle 6: Guided emergence	According to Sein et al. (2011), the artifact should be developed based on the interaction between team members, guided by continuously developing new knowledge in the context of the problem
Principle 7: Generalized outcomes	McCurdy et al. (2016) recognize the unique and specialized outcomes of the design process as well as the importance of generalizing findings

Expanding on the ADR methodology, Mullarkey and Hevner (2015) contend that ADR should also exhibit a rigorous problem diagnosis stage and submits four stages in their *elaborated* ADR process, as follows: (Fig. 3).

Take note that each iterative stage comprises problem definition (P), artifact creation (A), evaluation (E), reflection (R), and learning (L) activities. More specifically, the objective of each stage is as follows:

- The diagnosis stage intends to acquire a proper understanding of the larger domain area and how it correlates to the business problem.

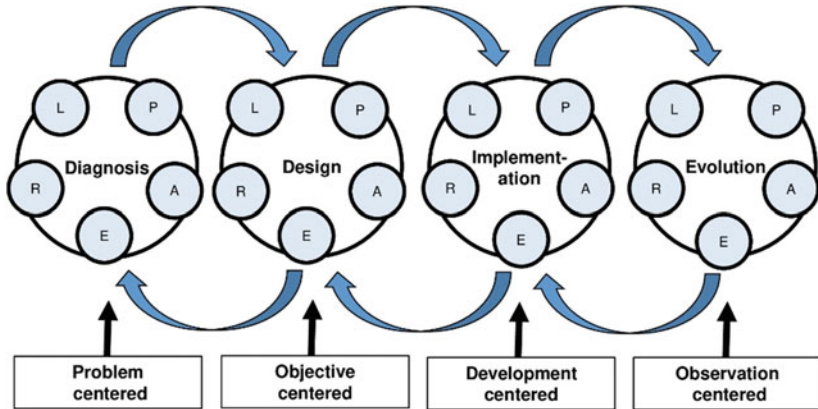


Fig. 3 The eADR approach (Source Adapted from Mullarkey [2018])

- The design stage may require several iterations of design principles, features, and models.
- The implementation stage aims to refine the artifact in the contextual operating environment.
- The evolution stage focuses on the continuous refinement of the artifact, taking note of new business realities.

In context, therefore, this research project focused on the problem-centric *diagnosis* stage and the objective-centered *design* stage.

5 RESEARCH EVIDENCE

5.1 Data Sampling

ETIKAN et al. (2016) define purposeful sampling as the deliberate choice of specific participants due to the qualities (knowledge and experience) they bring to the research. Palinkas et al. (2015) agree but also add the significance of their commitment to participate and the ability to convey experiences and opinions in an articulate, expressive, and reflective manner. In layman's terms, the researcher chooses what needs to be known and commences to find participants willing and able to provide the desired knowledge or experience. The general sampling guide for qualitative research is to keep the sample just big enough for new knowledge

and insight to emerge (Cooper & Schindler, 2008). Therefore, the sample size in qualitative research tends to be smaller than typical quantitative samples.

As mentioned above, this study utilized semi-structured interviews with selected participants, including senior managers and owners of businesses with local and international shareholding. The selection criteria for these contributors were based on their experience and seniority level while executing their business responsibilities in Mozambique. A total of 15 businesses participated in the study, and all were identified by purposive sampling. Through a guiding questionnaire completed during semi-structured, comprehensive interviews with the selected participants, the researcher collected the primary data used in this study. The aim of these interviews was to obtain the industry participants' perspectives about the general Mozambican market environment (i.e., SWOT and PESTLE-related aspects). Such perspectives served to gain an objective understanding thereof, and to internalize risk factors together with opportunities as the building block of the envisaged GSSM.

5.2 Data Collection

Per the ADR principles indicated above, the data collection (perhaps rather a knowledge development) took place during the various research iterations. Hence, principles 1 and 2 assist in the detailed definition of the problem under consideration, and the envisaged artifact, which is also continuously shaped by the perspectives of the academic and industry participants (principles 3 and 4) and by the outcome of authentic, concurrent evaluation (principle 5). In context, principles 3 to 6 specifically refer to the second and third stages of the ADR methodology, while principle 7 recognizes the noticeable and distinctive outcomes of the design process; it further emphasizes the importance of simplifying and abstracting research findings. Contextually, the GSSM's evolutionary development cycles through the *Alpha* design to the *Beta* design phases can be illustrated as follows (Fig. 4):

Mullarkey (2018) stated that for a DS artifact to be successful, it needs to be able to solve the business problem in a challenging problem domain with one or more innovative solutions being inspired, motivated, and informed by practice. In addressing this concern, the findings were continuously validated throughout the iterative eADR process in the researcher-practitioner team concept. Considering the above in context,

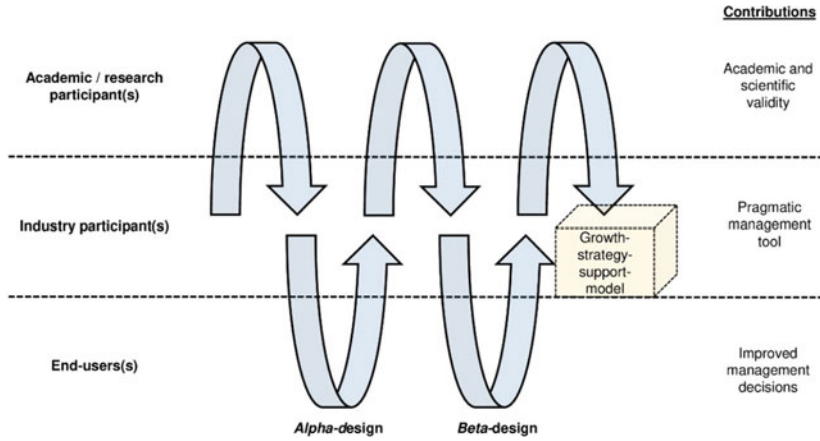


Fig. 4 Evolutionary design process (Source Adapted from Sein et al. [2011])

two crucial features were validated throughout, namely (1) addressing a real business problem and (2) having a rigorous *theoretical* foundation on which to base the research.

5.3 Data Analysis

Since qualitative research includes interviews with individuals central to the research topic, the research data are often in a text format, i.e., the accounts of what interviewees said or did. The interviewer will then typically analyze the data, which may potentially allow for the possibility of bias to creep in. As such, qualitative studies are often criticized for lacking rigor, transparency, and justification of data collection and analysis methods used, and hence the integrity of findings is often questioned (Hadi & Closs, 2015). It is, therefore, crucial to establish rigor to ensure the integrity of the research, which in this study's context will impact the growth strategies and policies.

An essential part of data analysis is to be true to the participants because their voices are being interpreted (Sutton & Austin, 2015). Interview data need to be analyzed through human coding, enabling (sub-) categories to be identified from the transcripts (Cooper & Schindler, 2008). For this study, the collected data was analyzed and the results were

evaluated based on the knowledge acquired from the literature review. The various eADR iterations entailed the following:

Problem-Centered: Diagnosis

This phase initially focused on defining the business problem of approaching strategic growth in unknown foreign markets and identifying data sources to support the development of the initial GSSM concept framework. An initial group of industry participants provided practical knowledge and experiences in developing the decision-support framework as the diagnosis artifact, as illustrated in the Table 2.

The acquired knowledge presented above, enabled the development of both internally and externally focused intelligence. To illustrate the integration of stakeholder and stewardship theories in context, the following summative conclusions are provided.

It seems evident that a resilient leadership team and a skilled labor force are crucial for any hope of success in Mozambique. There appeared to be a consensus that ex-pats offer an opportunity to bring the required skills into the fray. However, strict governmental employment quota requirements make this problematic. Furthermore, the comparatively low education levels and language barriers also contribute to ineffective knowledge transfer. Due to its economy's diverse nature, the country offers many opportunities in many sectors. While the participants seem to agree on a bullish economic development sentiment, currency and inflation expectations are more bearish. Crime concerns also seem to have little impact on organizational optimism. The availability and reliability of basic infrastructure are minimal. Due to potential volatility in the political arena, the prediction of the activities and reactions of political parties is complex, and corruption remains a concern. Even though it may seem that in Mozambique's multifaceted and dynamic economic environment, the challenges may outweigh the potential benefits, the country also has much potential—even if it initially relies on foreign donor investments.

Objective-Centered: Alpha Design

The first design iteration focused on the proof-of-concept *Alpha* design, based on knowledge acquired during the diagnosis stage. Per the primary objective, the envisaged GSSM should be designed to be populated and weighted according to the specific risk appetite and tolerance levels. If the level of risk falls within an acceptable range, all is good. However, should the risk levels exceed the predetermined tolerance levels, the growth

Table 2 Decision-support framework

<i>Organizational competitive analysis</i>			<i>Business environmental analysis</i>		
Internal analysis	S	Leadership/management style	P	Actions of political parties	
		Skilled labor		Local ownership content	
		Market share		Change in political leadership	
		Customer/supplier relationships		The political stability of neighbors	
		Footprint in country		E Economic growth forecast	
	W	Marketing and advertising	Inflation forecast	S	Impact of unemployment
		Availability of skilled labor	Impact of crime		
		Retention of skilled staff	Government impact on the social environment		
		Language barriers	Diversity of workforce		
		Available management	Organization's community improvement plans		
External analysis	O	Growth in the mining and gas industry	T	Telecommunication usage	
		Government spending		Stability of fixed line and mobile networks	
		Infrastructure development		Internet and Wi-Fi coverage and access	
		Foreign donor funding		Local technology support	
		Mergers with local entities		L Comprehension of local legislation	
	T	Routes to neighboring countries	Labor legislation		
		Lack of suitable skilled labor	Foreign exchange regulations		

(continued)

Table 2 (continued)

<i>Organizational competitive analysis</i>		<i>Business environmental analysis</i>
Political instability in Mozambique		Operating license requirements
Work permits for foreign employees	E	Healthcare and sanitation
Local ownership in organizations		Reliable electricity coverage
Health and safety of employees		Road and transport infrastructure
Foreign exchange regulation		Housing and schooling

initiative may be canceled, or some form of mitigating action could be found. Since each potential investor has a unique risk appetite, the model should allow for such and, therefore, the ability to assign *bespoke* weightings (or levels of importance) to the various factors, as illustrated Table 3.

In this study, the table above indicates that the political (30%) and economic (35%) categories significantly influence the Mozambican macro-environment. These areas would require the most in-depth scenario planning and risk-mitigating strategies. The specific steps followed in the *Alpha* design are elucidated as follows:

- Phase 1: Response analysis
 - Data extraction
 - PESTLE element rankings
- Phase 2: Risk analysis

Table 3 PESTLE category weightings

P	30%
E	35%
S	15%
T	5%
L	10%
E	5%
	100%

Table 4 PESTLE uncertainty score table

	<i>PESTLE weightings</i> (%)	<i>Relative risk weightings</i> (%)	<i>PESTLE uncertainty score</i> (%)
Cross-sectional weight	100		64
Political	30	63	19
Economics	35	65	23
Socio	15	60	9
Technology	5	87	4
Legislative	10	63	6
Environmental	5	60	3

- o Determine risk appetite and tolerance levels
- Phase 3: Comparative analysis
 - o Determine rating scores
 - o Determine risk appetite and tolerance achieved
- Phase 4: The model culmination
 - o Determine PESTLE uncertainty scores

These phases would be completed for all the PESTLE categories, culminating in a final summative uncertainty score table. For illustrative purposes, the results of the GSSM per this study are indicated in the Table 4.

From the information above, all the PESTLE elements, in this case, resulted in at least moderate risk levels or better, with an overall uncertainty score of 64%. This means that none of the elements posed risks that were not mitigatable. Overall, investments in the territory are moderately risky and could be further investigated.

Objective-Centered: Beta Design

The dynamic nature of the design process, together with an inability to analyze all possible design issues, often results in limitations in the final product (Horner & Atwood, 2006), which provides the contextual purpose of the *Beta* design research-practitioner team, i.e., a review and validation purpose. The *Beta* design iteration focused on reflecting on the *Alpha* design specification and the subsequent refining of the GSSM.

Whereas the *Alpha* design focused slightly more on operational experience, the *Beta* design participants included senior managers with strategic management experience in the territory.

During this process, the key advantages of the *Alpha* design include identifying and ranking contextual risks, aligning the risk appetite and tolerances levels with the model's outcome, and the ease of populating—once the requisite information has been collected. However, the objective is to develop a GSSM that can serve in the real business context. Hence, the researcher-practitioner team aimed to be critical in their scrutiny. To achieve a better understanding of potential limiting factors and how possible solutions could be formulated in a refined *Beta* design, several key points were debated, resulting in the re-scrutinizing of the following:

- Weightings allocated to the PESTLE elements.
- Relevance of the interview topics in each PESTLE category.
- Impact of the SWOT analysis on the preset PESTLE weightings.
- Justification for risk appetite and risk tolerance levels.
- Relevance of PESTLE element weightings, should they fall outside the predetermined acceptable risk levels.
- Generic application of the model.

Resultant of the above, it was reasserted that any (management) tool and decision is ultimately only as good as the information on which it is based.

6 RESEARCH CONCLUSION

Artifacts are the *vehicles* for disseminating knowledge, and while the researcher may guide the initial design, the final artifact emerges through the interaction between design and use. This implies that the artifact must ultimately manifest the intended together with the unintended organizational outcomes. Developing a practical artifact that can be put into operation and maintained in the ever-changing business environment of Mozambique is central to resolving the primary research objective of this study.

According to Popov and Chowdhury (2019), some countries have adopted an outward-looking business approach and are desirous to be more integrated with the world economy. This enables such countries to

exchange technologies and expertise with other countries. The availability of a growth-strategy support model may be seen as contributing to such. Furthermore, developing democracies tend to undergo regular changes as it evolves; organizations operating in these countries will need to have a resilience mindset and anticipate potential changes. Conducting regular PESTLE and SWOT analyses of this environment can assist in being aware of possible changes and how they could impact the organization and its strategies.

7 PRACTICAL EXPERIENCES

Effective strategic management is a crucial skill that relies upon high-level, holistic information pertinent to the specific context. As such, even though strategic management decisions cannot be made in silos, there could be a tendency for such decisions to be made subjectively. The problem addressed in this study is indicative of such complexity. An unspoken but implied objective of the study is to take qualitative information, remove subjectivity (to some extent), and provide quantitative support to guide strategic growth decisions in context.

In executing the research in context, some practical concerns emerged. Firstly, there was the issue of geography. Industry participants were in different regions, which spanned vast distances and national borders. Secondly, there were safety concerns when traveling in Mozambique, particularly the northern areas, which are politically unstable from time to time. Finally, there was also a lack of infrastructure when traveling through the country, such as road, telecommunications, health, and related aspects. However, ultimately the GSSM can also serve as a guide in analyzing these concerns.

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Concluding Comments

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1 BACKGROUND

The impact of the 4th Industrial Revolution on contemporary society is undeniable, and the overload of information and dynamism often plays havoc on business management efforts. In this context, managers require reliable and focused intelligence when circumnavigating treacherous business and market environments. In an era of *fake news*, practical and sound business research is arguably one of the best ways to generate actionable intelligence in a specific organizational scenario.

It is essential to distinguish between the role of business research in a purely academic context and the generation of actionable business information. Very often, an argument is made that research in the business sciences is pragmatic by default—we are researching *business* problems, so

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why would it not be? Very often, this is true, i.e., academics in the broader economic and management sciences doing research in their fields of business expertise are addressing pertinent business issues and problems—at least they are attempting to. However, very often, the (ultimate) aim of such academic research is to publish such research in a peer-reviewed journal and further their academic career and standing.

Although we don't dispute this reality, some industry managers are facing a specific business issue and want to generate useful business information in context. Even though such managers may wish to obtain a post-graduate qualification *en route* to developing such intelligence, they are not expressly desirous of an academic career. This book is primarily targeted at these readers, i.e., industry managers facing a bespoke, targeted business problem in their context, which needs to be addressed in a scientifically sound manner.

2 SUMMATIVE OBSERVATIONS

The scope of business research encompasses multiple managerial disciplines and spans many industries. Non-academic business researchers may quickly be overwhelmed by the multitude of applied research methodologies, some of which may not be the optimum approach in their context. The question is, which method to follow? The book aimed to assist business researchers from two perspectives.

Firstly, a methodical roadmap to identify, clarify, and select the most appropriate business research approaches to empower business researchers, assisting them to grasp the importance of academically sound business research and deliver pragmatic solutions to their business problems. In this context, Chapter 2 provided an overview and roadmap aiming to simplify business research for those that do not have the disposition to *research* appropriate business research methodologies.

Secondly, multiple prior business research examples were provided in Chapters 3 to 18 to share actual research experiences in context. The illustrative research examples were categorized into four themes and presented as follows:

2.1 Theme 1: Positivism

Positivism was described as a paradigm in which observations and experiments are used as the basis for knowledge generation (Rahi, 2017) and

typically encourages objective, *quantitative data* analysis. The illustrative essays highlighted the following:

- Firstly, from a financial reporting and management perspective, *essay one* explained how regression analysis found a positive association between African countries adopting IFRS and FPI.
- In a financial risk management context, *essay two* elucidated the impact of different forms of stationarity on financial time series analysis on data obtained from the JSE.
- In the context of investment portfolio management, *essay three* tested the relationship between intraday returns, volatility spillovers, and market Beta during financial distress.
- Finally, *essay four* investigated the exchange rate puzzle following an experimental research strategy to prove whether the puzzle is a pseudo mystery.

2.2 Theme 2: Post-positivism

In contrast to positivism, post-positivism does not provide exact answers or generalizable findings but pursues phenomenological evidence (Nieuwenhuis, 2020) and typically includes both qualitative and quantitative (*mixed-method*) perspectives. The post-positivistic essays were as follows:

- Firstly, within a financial management context, *essay five* researched the policy implementation of credit management at selected South African Universities of Technology.
- From the perspective of commodity risk management, *essay six* investigated white maize strategies in South Africa using a two-phase approach.
- In a social responsibility reporting context, *essay seven* developed a water disclosure index based on data from 49 companies from three indices, the JSE, ASX, and DJGSI.
- As the final research in this theme, *essay eight* focused on the role of instructional leadership in enhancing financial accounting students' learners' performance.

2.3 *Theme 3: Interpretivism*

Interpretivism concentrates on human action and is descriptive, subjective, and explorative, with limited generalizability of its findings (Kekeya, 2019), and is primarily *qualitative* in nature. The following interpretivist research experiences were shared:

- From a taxation perspective, *essay nine* researched the daily tax compliance and related experiences facing SMEs in South Africa.

2.4 *Theme 4: Critical Theory*

Critical theory straddles aspects of interpretivism and positivism as research approaches, primarily to enhance understanding reality (Kekeya, 2019). Such approaches are qualitative and reflective of *society/social* issues in nature. The illustrative essays highlighted the following:

- From an industrial psychological perspective, *essay 10* assisted university management by exploring first-year students' study demands and resources in transition.
- In a philosophical paradigm, *essay 11* reflected on the legitimacy predicament of current-day accounting theory in the context of real-life demands.

2.5 *Theme 5: Pragmatism*

Practical considerations, rather than theoretical, guide pragmatism and have a very *practical* dimension (Kivunaj & Kuyini, 2017). By extension, design science research produces artifacts as solutions to problems (Vom Brocke et al., 2020). Pragmatist approaches can be *qualitative, quantitative, or a combination* thereof, as illustrated below:

- As the first pragmatist essay focusing on a strategic vision aspect, *essay 12* developed a competitive strategy for an automotive distribution company preparing for Saudi Vision 2030.
- Shifting toward an engineering management focus, *essay 13* produced an artifact for a risk-based approach to acquiring electronic mine safety equipment.

- With its strategic cost management perspective, *essay 14* utilized a design science approach to develop a channeling framework for healthcare service provider networks for a South African medical scheme.
- Returning to an engineering management focus, *essay 15* developed an airborne electronic system development process and controls in a defense environment.
- As the final essay, focusing on strategic management and market penetration, *essay 16* developed a growth-strategy support model to enable cross-border expansion stratagems.

3 CLOSING

Per the objectives set out in the first chapter, this book provides industry managers or researchers who may not have extensive academic research training or experience guidance when embarking on business research. As opposed to pure, focused academic research aimed primarily at peer-reviewed publications, industry managers typically have a different desired outcome for their study. This, however, does not mean that research conducted by industry managers will not be able to withstand the scrutiny of a peer-review process and get published in such a manner.

Finally, the reader must note that the illustrative essays provide the unique experiences and results of independent business research projects in a post-graduate context. Other researchers may not have similar experiences.

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INDEX

A

- Accounting, 6, 7, 37, 43, 47–51, 54, 57, 161, 163, 165, 166, 168, 174, 182–185, 187–192, 194–200, 220, 251–263, 385
- Accounting philosophy, 254, 258, 259, 262
- Accounting theory, 7, 48, 251–253, 256–258, 262–264, 386
- Action Design Research (ADR), 8, 9, 320, 321, 323, 336, 343, 346, 354, 355, 367, 368, 370
- Activity-based risk (ABR), 292, 298, 301–303, 305–307, 309, 310
- Actor-network theory (ANT), 8, 268, 272
- Airborne electronic equipment, 9, 336, 337, 339–342, 350, 353, 355, 356
- Archival research, 52, 68, 83, 107, 126, 304, 343

B

- Beverage and tobacco industry, 158, 159, 161, 164, 166, 172, 174, 175
- Business research, 2–4, 9, 11–14, 16, 17, 19, 21, 27, 30, 33, 35, 37, 163, 365, 383, 384, 387

C

- Case study research, 274, 296, 299, 320
- Coding, 126, 169, 175, 214–218, 242, 278, 285, 371
- Competitive intelligence (CI), 268–270, 274
- Competitive strategy, 8, 268, 269, 271–273, 282, 283, 285, 386
- Cost management, 317, 387
- Credit management, 6, 118–124, 126–134, 385
- Critical theory, 3, 7, 28, 30, 386

D

Decision-usefulness, 42, 44, 48–50, 57, 253, 254, 257, 260–263
 Deductive approach, 67, 82, 105, 165
 Design science research (DSR), 8, 9, 292, 295–300, 305, 307, 309, 336, 341, 343, 354, 355, 386

E

Efficient market hypothesis (EMH), 78
 Elaborated Action Design Research (eADR), 9, 314, 317, 319–324, 326, 330, 331, 360, 361, 366, 370, 372
 Empirical evidence, 12, 21, 51, 153
 Ethics, 7, 65, 104, 160, 232–234, 254, 256, 257
 Experimental research, 23, 52, 257, 292, 299, 309
 Experimental research strategy, 5, 52, 385
 Explanatory sequential design, 189–191, 193, 195

F

First-year students, 7, 226–232, 234, 235, 238, 243–245, 386
 Foreign portfolio investment (FPI), 4, 41–43, 46–57, 385
 Forward exchange rate, 5, 99, 101, 102, 104, 106, 108, 109, 111–113
 Fractionally integrated, 64, 72

G

Growth strategies, 9, 359–361, 367, 371, 377

H

Healthcare costs, 316
 Healthcare service providers, 8, 316, 317, 325, 331, 387

I

Inductive approach, 215, 232, 298
 Instructional leadership, 6, 181–191, 193–200, 385
 Integrated reporting (IR), 6, 158–166, 168, 169, 171–175
 International Financial Reporting Standards (IFRS), 4, 41–44, 46–57, 385
 Interpretive phenomenology, 7, 208–211, 220
 Interpretivism, 3, 7–9, 24, 28–33, 42, 44, 142, 143, 153, 163, 164, 186, 208, 209, 255, 318, 319, 366, 386

L

Learner performance, 6, 182, 189, 194, 199

M

Market beta, 5, 78, 85, 89, 90, 96, 385
 Mixed-method research, 186, 319

P

Peri-urban university, 7, 245
 PESTLE analysis, 364
 Positivism, 3, 24, 27–32, 42, 44, 46–48, 142, 153, 163, 255, 366, 384–386
 Post-positivism, 3, 7, 28, 30, 32, 123, 142, 143, 153, 163, 164, 186, 366, 385
 Pragmatic research, 187, 336

Pragmatism, 3, 8, 24, 27–30, 32, 42, 44, 142, 163, 186, 272, 330, 386

Q

Qualitative research, 7, 23, 34, 52, 124, 144, 167, 190, 227–229, 231–235, 237, 243, 245, 276, 292, 342, 369–371

Quantitative data, 3, 4, 6, 8, 34, 42, 105, 118, 123, 125, 127, 130, 145, 147, 153, 167, 168, 189, 190, 268, 271, 274, 275, 278, 279, 281, 305, 314, 385

R

Realized future spot exchange rate, 5, 102, 105, 111–113

Reflective research, 255, 263

Regression analysis, 4, 42, 45, 54, 56, 62, 65, 67, 68, 73, 129, 131, 172, 385

Research design, 8, 12, 14, 21, 23, 25, 26, 35, 37, 42, 44, 64, 65, 80, 103, 142, 159, 162, 186, 206, 207, 229, 231, 253, 318–320, 366

Research evidence, 37, 73, 89, 111, 129, 150, 159, 172, 194, 206, 253, 268, 275, 305, 330, 351, 369

Research methodology, 2, 14, 24, 25, 35, 43, 45, 83, 107, 157, 158, 162, 252, 317–319, 330, 365

Research philosophy, 24, 25, 46, 47, 61, 62, 65, 81, 82, 100, 103, 104, 162, 187, 297, 318, 319, 365

Research problem, 8, 9, 12, 14, 17, 19–22, 32, 35, 37, 41, 43, 50, 62, 64, 65, 80, 83, 100, 102,

103, 121, 132, 140, 142, 144, 151, 158–160, 166, 168, 185–187, 190, 200, 206, 231, 253, 270, 285, 294, 316, 318, 337, 339, 359, 361, 362

Risk analysis, 8, 301, 304, 309, 374

Risk appetite, 296, 372, 374–376

Risk tolerance, 376

S

School management, 182

Service provider profiling, 330

Small business owners, 7, 206, 208–211, 213, 218–220

Student accounts, 118–120, 122, 126–129, 132–134

Student debt, 118–122, 124–128, 131–133

Student experiences, 120, 125, 229, 230

Survey, 26, 32, 52, 68, 83, 107, 126–128

SWOT analysis, 273, 277, 282, 363, 376

Systems engineering (SE), 291, 292, 294, 296, 298, 299, 309, 336, 338, 343, 347, 349, 353, 356

T

Taxation, 56, 219, 220, 386

Teaching and learning, 182–185, 190, 193, 195, 197, 199

Tests for stationarity, 70–72, 74

Thematic analysis, 7, 118, 129, 193

Triangulation, 30, 118, 122–125, 132, 145, 164, 167, 241, 271, 275, 279, 282

U

University, 117, 119, 121, 123–125, 128, 130, 133, 225–228, 230,

232, 234–236, 238, 243–245,
277, 386

V

Volatility spillovers, 5, 79, 87, 88, 90,
96, 109, 385

W

Water disclosure, 6, 157, 158,
160–164, 166–170, 172–175,
385