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# Feedback analysis of organizational processes: a control systems approach

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# DECLARATION

I hereby declare than any work performed and displayed in the following report is my own, and any information that has been acquired from outside sources has been given appropriate credits and references.

Oren Chazan _____

# PREFACE

The following dissertation is a Masters-level research project report for the School of Mechanical Engineering at the University of the Witwatersrand. The supervisor for this assignment is Dr. Ionel Botef. The title of the dissertation is “Management Theory: A Feedback Perspective”. This project was undertaken during the period February 2010 – July 2014.

# ABSTRACT

The purpose of this research is to provide a brief, yet comprehensive overview of Management theory from its formal inception to present day. This overview highlights the key figures, key assumptions made and key concepts of Management Theory.

In addition, the dissertation will provide an overview of the historical and contemporary arguments within Management theory.

Concentrating on the subject of a unified theory of Management, the argument is suggested that the Control Model has many benefits to offer in light of its being both a formulaic and graphical medium.

With reference to the South African context, it is suggested that these benefits have particular relevance to Management practice, in light of the challenges and cultural differences described in other studies.

In order to demonstrate these benefits, Feedback is selected as an appropriate focal point of the Control Model.

Furthermore, Feedback is identified as a fundamental component in addressing, and ultimately resolving, these challenges.

Conclusions and implications for further study are discussed as well as the limitations of the current study. Recommendations for further research in the conceptual application of the Control Model are also detailed accordingly.

# TABLE OF CONTENTS

DECLARATION ..... i

PREFACE ..... ii

ABSTRACT ..... iii

TABLE OF CONTENTS ..... 1

LIST OF FIGURES ..... 7

LIST OF TABLES ..... 9

1 INTRODUCTION ..... 10

1.1 Background of the Research ..... 10

1.2 Justification of the Research ..... 12

1.3 Research Problem ..... 12

1.4 Delimitation of Scope ..... 14

1.5 Research Question and Hypothesis ..... 14

1.6 Outline of Dissertation ..... 15

1.6.1 Chapter 2 – Research Issues ..... 15

1.6.2 Chapter 3 – Methodology ..... 15

1.6.3 Chapter 4 – Analysis of Data ..... 16

1.6.4 Chapter 5 – Conclusions and Implications ..... 16

1.7 Conclusions ..... 17

2 RESEARCH ISSUES ..... 18

2.1 Historical Overview of Management Theory ..... 18

2.1.1 Introduction ..... 18

2.1.2 Late 18th Century up to the 20th century ..... 18

2.1.3 Early 20th century ..... 19

2.1.4 Management Science Theory: The Quantitative Approach ..... 21

2.1.5 Late 20th Century to Present ..... 22

2.2 Arguments within Management Theory ..... 24

2.2.1 Introduction ..... 24

2.2.2 Lack of a Unified Theory of Management ..... 24

2.2.3 Management Reality is Too Complex ..... 25

2.2.4 Management Theories are "Over-Scientific" ..... 26

2.2.5 Management Theories Apply Only in a Limited Context ..... 26

2.2.6 Management vs. Control ..... 26

2.2.7 Management Theories are Not Scientific Enough ..... 27

2.2.8 Cultural Factors ..... 27

2.2.9 Shortage of "Interesting" Research ..... 27

2.2.10 Closed vs. Open Systems ..... 28

2.2.11 Emphasis of the External Environment ..... 29

2.3 Application: Management Theory in South Africa ..... 29

2.3.1 Introduction ..... 29

2.3.2 Managers are Aloof ..... 30

2.3.3 Open Communication and Language ..... 30
2.3.4 Social Attitudes Leading to Conflict ..... 30
2.3.5 Individualism and Collectivism ..... 31
2.3.6 Investment in People ..... 31
2.3.7 BEE and Skills Shortage ..... 31
2.3.8 Performance Measurement ..... 31
2.3.9 Recommendations for Solving Management Challenges in South Africa ..... 32
2.4 The Control Model ..... 34
2.4.1 Introduction ..... 34
2.4.2 Fundamentals of Feedback ..... 34
2.4.3 Background to Control ..... 34
2.4.4 Fundamentals of Control Systems ..... 35
2.5 Conclusions ..... 40
3 METHODOLOGY ..... 41
3.1 Introduction ..... 41
3.2 Context of the Research ..... 41
3.3 Research Objectives and Assumptions ..... 42
3.4 Research Considerations ..... 43
3.4.1 Overview of Management Theory ..... 43
3.4.2 Management in South Africa ..... 44
3.4.3 Control Theory ..... 44

3.5 The Unit of Study and Sample ..... 44
3.6 Research Findings ..... 46
3.7 Conclusions ..... 48
4 ANALYSIS OF DATA ..... 49
4.1 Unified Theory of Management ..... 49
4.1.1 Introduction ..... 49
4.1.2 Feedback in Management Theory – Introduction ..... 50
4.1.3 Feedback in Management Theory – Systems ..... 51
4.1.4 Feedback in Management Theory – Social Sciences and Psychology ..... 53
4.2 Ubuntu and Management in South Africa ..... 55
4.2.1 What is “Ubuntu”? ..... 55
4.2.2 Ubuntu in Management ..... 56
4.2.3 Ubuntu and Management in South Africa ..... 57
4.3 Feedback as the Ideal Communicator ..... 59
4.3.1 The Simple Feedback Loop Revisited ..... 59
4.3.2 Feedback as the Ideal Communicator ..... 62
4.4 Reduction of Management Scenarios and Feedback Loops ..... 65
4.4.1 Introduction ..... 65
4.4.2 Company Structure Diagram ..... 65
4.4.3 Company Vision Diagram ..... 67
4.4.4 Feedback Procedures or Structure Diagram ..... 69

4.4.5 Performance Measurement ..... 72
4.5 Conclusions ..... 79
5 CONCLUSIONS AND IMPLICATIONS ..... 81
5.1 Introduction ..... 81
5.2 A Brief Overview of Previous Chapters ..... 81
5.3 Conclusions about the Hypothesis and Research Question ..... 84
5.3.1 Introduction ..... 84
5.3.2 Review of the Research Question ..... 84
5.3.3 Collaboration between Theory and Practice ..... 85
5.3.4 Concluding Remarks ..... 86
5.4 Research Implications ..... 86
5.4.1 Implications for Theory ..... 86
5.4.2 Implications for Practice ..... 87
5.5 Research Limitations ..... 88
5.6 Further Research ..... 89
5.6.1 Unified Theory of Management ..... 89
5.6.2 Developing the Conceptual Understanding of Feedback (Loops) ..... 90
5.6.3 Ubuntu Management in South Africa – A Model for Organizational Design ..... 90
5.6.4 Developing the Socio-Economic Variable of Management Theory ..... 90
5.6.5 Empirical data for an “Ubuntu-Control” Approach to Organizational Culture ..... 90
6 REFERENCES ..... 91

7 APPENDICES ..... 97

APPENDIX A – Henri Fayol's Principles for Management ..... 97

APPENDIX B – Boulding's Hierarchy of Complexity ..... 98

APPENDIX C – Koontz's Twelve Principles of Control ..... 99

APPENDIX D – Beer's Viable Systems Model (VSM) and Team Syntegrity Protocol (TSP) ..... 101

APPENDIX E – Marikana ..... 104

APPENDIX F – Mining, Manufacturing and Foreign Investment ..... 105

# LIST OF FIGURES

Figure 1: Timeline of General Management Theory ..... 23

Figure 2: Negative Feedback Loop ..... 28

Figure 3: Mirror directing a Beam ..... 35

Figure 4: Feedback control for human body temperature ..... 37

Figure 5: The Elements of a Feedback Control System ..... 38

Figure 6: Characteristics of Feedback ..... 40

Figure 7: Closed-loop System with Feedback ..... 52

Figure 8: Open System with Feedback ..... 53

Figure 9: An Adaptive Self-regulation Model ..... 55

Figure 10: Simple Control System ..... 60

Figure 11: Simple Factory as a Control System ..... 62

Figure 12: Common example of an Organogram ..... 66

Figure 13: Feedback version of an Organogram ..... 67

Figure 14: Company Vision Statement ..... 68

Figure 15: Feedback version of Company Vision Statement ..... 69

Figure 16: Example of a Feedback Procedure Diagram ..... 71

Figure 17: Jane's results over a 6 month period ..... 76

Figure 18: Jane's performance represented using Gain ..... 77

Figure 19: Jane's performance represented using Variance ..... 78

Figure 20: Viable Systems Model (VSM) ..... 102

Figure 21: The Syntegrity Icosahedron ..... 103

# LIST OF TABLES

Table 1: Composition of STEM Students in Top Ranked MBA Programs ..... 11

Table 2: Key Contributors to Management Theory ..... 24

Table 3: Instrumentalism vs. Humanism ..... 56

Table 4: Summary of Management challenges in South Africa ..... 57

Table 5: Suggestions to Resolve Management Challenges ..... 58

Table 6: Jane's results over a 6 month period ..... 75

# 1 INTRODUCTION

## 1.1 Background of the Research

The subject of Management Theory has received particular attention over recent decades. Not only has the academic community invested in the development of the subject, the number of 'non-academic' literary works being purchased by the general public has reached 'epic proportions': According to a recent article, approximately 11,000 new business books are published every year (Spitznagel, 2012). These books are generally based on the experience of past or present-day Management "*gurus*" (as they have become termed) as well as the attempt to reduce Management principles into basic 'self-help' guides. This type of Management practice has been humorously termed MBBS syndrome – "Management by Best Seller" (Kreitner, 2006).

The MBA (Master of Business Administration) degree has become increasingly popular and is now the foundation of any reputable business school. Professionals from all industries and backgrounds are seeking this qualification as a means of advancing their careers onto 'Management level' (Mahlaka, 2014; Symonds, 2014).

Of those seeking to advance their career through acquiring the MBA accreditation, Engineers make up a significant proportion. A recent study showed that Engineers made up the second largest group of candidates applying for MBA programs (Schoenfeld, 2012). An overview of some of the highest-ranked MBA programs[1] showed that students with an undergraduate degree in STEM (Science, Technology, Engineering and Mathematics) disciplines comprise, on average, between 17% - 40% of the class – See Table 1.

[1] Source: http://www.economist.com/whichmba/full-time-mba-ranking

| Rank (2014) | Business School | Country | Percentage of STEM Students (%) |
|---|---|---|---|
| 1 | University of Chicago – Booth School of Business | United States | 23[2] |
| 2 | Dartmouth College – Tuck School of Business | United States | 32[3] |
| 3 | University of Virginia – Darden School of Business | United States | 27[4] |
| 4 | HEC School of Management, Paris | France | No available data |
| 5 | University of Navarra – IESE Business School | Spain | No available data |
| 6 | Harvard Business School | United States | 40[5] |
| 7 | University of California at Berkeley – Haas School of Business | United States | 28[6] |
| 8 | New York University – Leonard N Stern School of Business | United States | 17[7] |
| 9 | Stanford University – Graduate School of Business | United States | 38[8] |
| 10 | Columbia Business School | United States | 24[9] |

Table 1: Composition of STEM Students in Top Ranked MBA Programs

A survey done of 467 MBA graduates from South African business schools showed that the "average annual salary increased by 32% between the periods before obtaining an MBA and the first job after obtaining the degree" ("MBA.co.za Salary Survey," 2006).

[2] Source: http://www.chicagobooth.edu/programs/full-time#simple2

[3] Source: http://www.tuck.dartmouth.edu/admissions/tuck-class-profile

[4] Source: http://www.darden.virginia.edu/web/MBA/Students-Alumni/Class-Profile/

[5] Source: http://www.hbs.edu/mba/admissions/class-profile/Pages/default.aspx

[6] Source: http://mba.haas.berkeley.edu/community/classprofile.html

[7] Source: http://www.stern.nyu.edu/programs-admissions/full-time-mba/students/class-profile

[8] Source: http://www.gsb.stanford.edu/programs/mba/admission/evaluation-criteria/class-profile

[9] Source: http://www8.gsb.columbia.edu/programs-admissions/mba/student-life/class-profile

The study of Management is therefore an important part of furthering one's career. Whether in Finance, Law, Humanities or Engineering; the ability to '*manage'* is pivotal to every industry and discipline.

The attention given to this subject, both academic and non-academic, indicates a pursuit by the general professional public to gain insights and skills in Management practices and philosophy.

## 1.2 Justification of the Research

It is unclear at this stage what is behind the sudden rise in publications of books written on the subject of Management. Many hypotheses can be supported, although this not the subject of this study.

In any event, it is clear that the professional community is seeking insight and clarity on how best to practise the 'art' of successful Management. Subsequently, the theories of Management must therefore be adequate in meeting this demand and guiding these professionals towards an efficient and effective Management paradigm.

In addition, the fact that Management is common across all industries and disciplines infers that the theories of Management should also need to be versatile and broad enough to apply to each and every sphere of commercial activity. Alternatively, each industry should need to forge its own set of 'Management Principles" that can adequately govern its practise.

The study of Management, or Management Theory, is therefore not only aimed at those fields which study commerce, industrial psychology or operations Management. The Engineering faculty (or any other faculty) is equally implored to engage in the quest for effective Management. The fact that Engineering is rooted in the advancement of scientific technology, does not excuse it from its responsibilities in the development of the 'human experience'. Mankind is only able to advance in the areas of technology if the 'people behind it' are equally fit for the task.

"Technology does not drive change -- it enables change." - Anonymous

## 1.3 Research Problem

Management Theory has been under academic scrutiny for over a century. The advent of the Industrial Revolution established a new reality for the commercial world. With this new reality, came the need for organizations to institute a means of producing high worker efficiency - a 'productive workforce' (Chandra, 2004).

Over the last century, theorists have expanded the subject of Management Theory into a wide range of methods for Management practise. A collection of disciplines or 'streams' of Management thinking has subsequently evolved (Koontz, 1961).

As Alfred North Whitehead said: "The art of progress is to preserve order amid change, and to preserve change amid order."

With the 'progress' made in Management Theory, comes a multitude of debate, dissent and 'confusion' within the academic community. Many doubts have been raised about the practical relevance of Management theories as well criticisms being 'hurled back and forth' between the various 'schools' (Koontz, 1961).

In South Africa, a country that has only recently become a democracy, the topic of Management has received much attention. The challenges in managing a workforce in this country are varied and complex. Many researchers have grappled with these issues and continue to do so, in order to aid this developing economy in achieving higher performance (Mangaliso, 2001; Mbigi, 1997).

Researchers have offered various suggestions and strategies to deal with these challenges, and this debate occupies many of the discussions found within the classroom on programs like the MBA[10]. One can understand how those students who have studied for example, Industrial Psychology or Project Management, to be able to comment on this topic, for they have studied those disciplines concerned with human behaviour within the workplace.

But what can be said for the Engineering students? The discipline of Engineering is defined as: "The branch of science and technology concerned with the design, building, and use of engines, machines, and structures." (Oxford Dictionary[11]). Engineering is essentially concerned with the "non-human" or "machine" world. How does a background in heat flow, for example, make one an authority on how best to manage a team of human beings?

[10] The assertion is based on the fact that MBA programs teach students about 'Management', therefore, it is logical to assume that discussions around Management theories, their relevance etc., occupy some of the classroom debates.

[11] Source: http://www.oxforddictionaries.com

"Engineering is about things. Management is about people" - Stephen Balzac[12]

How can the Engineering faculty contribute towards the future of Management Theory, and assist in improving Management practises in a country like South Africa?

## 1.4 Delimitation of Scope

The research conducted in this study is restricted to literary sources found in academic journals and books.

The author has chosen to adopt a broad-based analysis of the information collected during the study. This is due to the fact that the subject of Management Theory is too vast to adequately describe in its entirety.

Similarly, Engineering Theory is also too broad to be reduced into a single study. Therefore, the author has elected an exclusionary approach that identifies a single 'area' of Engineering Theory to be analysed. This is not to suggest that other areas are 'less relevant', but rather the selection is based on evidence found in texts as well as references or allusions made within Management texts towards this particular area of Engineering Theory.

Overviews of Management Theory have been published in past years, and it is on the basis of such texts that this study of Management Theory is predominantly based. Other texts have provided additional information to complement these overviews.

Any mathematical, or formulaic discussion presented in this dissertation will assume the reader is of a 'non-mathematical' background and will address the subject from a conceptual standpoint, drawing logical inferences from the mathematical principles already developed in scientific theorems.

## 1.5 Research Question and Hypothesis

This study aims at addressing the following question:

Can Engineering Theory truly provide any tangible contribution to the field of Management Theory?

Indeed, this question has many facets: Firstly, it addresses whether the worlds of man and machine are intrinsically linked. Second, it speaks to the holistic nature of Management in whether it conforms to

[12] Source: http://www.todaysengineer.org/2011/Sep/career-focus.asp

the same structure or archetype as a ‘true science’. Lastly, it concretizes whether the study of Management stands as a separate discipline that an Engineer must acquire, or rather that Management is an application or ‘branch’ of the scientific canon, similar to say Physics, Chemistry or Mechanics.

Consequently, the hypothesis is offered that not only can Engineering, the “machine-orientated” faculty have ‘an opinion’ on the subject of Management, it can in fact, offer a unique perspective that can aid in resolving many of its challenges.

## 1.6 Outline of Dissertation

The following chapter describes the outline of this dissertation and provides an overview of the content of each chapter:

### 1.6.1 Chapter 2 – Research Issues

This chapter describes the investigation of relevant literature on the following topics:

- Historical Overview of Management Theory - Following the historical timeline, this Chapter introduces key figures in Management theory development and the key concepts they contribute.
- Arguments Facing Management Theory - Historical and contemporary arguments in Management Theory are reviewed.
- Application: Management Theory and South Africa - The subject of Management Theory in South Africa is introduced and expounded.
- The Control Model - The Control Model, as it relates to Engineering Theory is reviewed from a conceptual standpoint. The concept of “Feedback” is introduced.

### 1.6.2 Chapter 3 – Methodology

This chapter describes the specific research methods adopted in this study. The objectives of the study are defined, as well as any key assumptions made during the study.

Considerations were made during the course of the research for various reasons. These as such, are detailed in this Chapter of the dissertation.

Lastly, the strategy employed in the selection of texts, or ‘data’, is defined and described.

### 1.6.3 Chapter 4 – Analysis of Data

This chapter details the analytical aspects of the study. Following the investigation of the various texts, the following sub-Chapters detail the findings of the study:

- Unified Theory of Management – The subject of a "lack of a unified theory of Management" is defined and elucidated. This represents the basis for establishing a logical argument for the relevance of Engineering Theory in Management.
- Ubuntu and Management in South Africa - The 'philosophy' known as "Ubuntu" is defined and explained in terms of Management challenges facing South African organizations. The uniqueness of this 'framework' or 'model' are explained and conclusions are drawn on the contribution to Management Theory.
- Feedback as the Ideal Communicator - Feedback mechanisms (loops) are analysed from a conceptual perspective and conclusions are drawn on their effectiveness.
- Reduction of Management Scenarios and Feedback Loops - A reductionist approach to Management is introduced whereby all Management structures can be addressed within the 'Feedback loop paradigm'.

### 1.6.4 Chapter 5 – Conclusions and Implications

This final chapter concludes the findings of this study and offers suggestions and recommendations for future research into the topics addressed in this dissertation.

These are categorized as follows:

- Feedback in South African Organizations - Guidelines for implementing Feedback structures are defined and recommendations are made to address the challenges facing South African organizations.
- Feedback Culture in Organizational Design - Guidelines for organizational design are discussed and recommendations are made on how to instil Feedback culture within organizations.
- Limitations and Implications for Future Study - The limitations of the research are identified and suggestions are made into further study in the areas of Management Theory and Organizational Design.

## 1.7 Conclusions

This study is concerned with the subject of Management Theory and in particular, the question of whether Engineering Theory can provide any significant contribution towards the challenges affecting Management theories and their organizational practises.

It is important to note that this study also aims to provide the reader with a perspective on the historical progression of Management Theory. This is aimed at establishing a 'backdrop' for understanding the challenges facing Management Theory.

In addition, the subject of Management in South Africa is elected, not only as an example of the issues involved in implementing Management theories, but also as a relevant subject for research within the Engineering faculties of South African tertiary institutions.

In conclusion, the future of Management Theory, indeed the future of Management itself, rests on the academic community as a collective whole. The onus lies on each individual to commit wholeheartedly to this noble and worthy cause.

# 2 RESEARCH ISSUES

## 2.1 Historical Overview of Management Theory

### 2.1.1 Introduction

In order to provide an effective overview of Management Theory, it is necessary to distinguish between earlier publications that have already summarized and categorized the various philosophies of Management thinking.

In so doing, one must first define what is meant by the term "*Management*".

Many disciplines have stemmed from the broader term "*Management Theory*", each into its own specialized field. Each of these fields is defined by some primary idea or axiomatic principle. The following overview follows the development of four main theory-groups:

- General Management Theory
- Management Control Theory
- Cybernetics
- Systems Theory

Following the historical timeline, introducing key figures in Management theory development and the key concepts they contribute, each person's contribution has then categorized as a part of a particular "school of thought."

Many overviews of Management theory have already been published. It is important to note that the historical overview presented below is by no means exhaustive and aims to provide the reader with a brief synopsis of critical developments in Management Theory and the "main" schools of thought represented by the many contributors to the theoretical development of the subject.

### 2.1.2 Late 18th Century up to the 20th century

- **Adam Smith- Job Specialization**

The first formal introduction of Management practices and more significantly, formal Management thought, came with the Industrial Revolution of the late 18th century.

Machine power was rapidly substituted for human power, which made it economical to manufacture goods in factories.

With the development of big organizations, a formal theory to guide managers running these organizations efficiently and effectively was needed.

The second major evolution came with the advent of the concept of *Job Specialization* i.e. the division of labour into specific, narrow repetitive tasks.

The general popularity today of job specialization is undoubtedly due to Smith's view about division of labour (Chandra, 2004).

### 2.1.3 Early 20th century

- **Scientific Management - Frederick Taylor**

During the early 20th century the state of Management practices was thus that no clear concepts existed on the dynamic between mangers and their staff. No effective work standards existed, and in general, workers and managers constantly were in conflict and each trying to gain the upper hand to the detriment of the other.

Frederick Taylor (known as the father of Scientific Management) published his work "The Principles of Scientific Management" which became widely accepted by managers throughout the world.

Taylor's Four Principles of Management (Taylor, 2004)

1. Develop a scientific way for each element of an individual's work, which replaces the old rule-of-thumb method.
2. Scientifically select and then train, teach, and develop the worker.
3. Heartily cooperate with the workers so as to ensure that all work is done in accordance with the scientific way that has been developed.
4. Divide work and responsibility almost equally between managers and workers. Managers take over all work for which it is better fitted than the workers.

- **Emerson – Introduces Control**

Harrington Emerson emphasized the importance of control in order to achieve efficiency: The view of Management as a process of controlling processes to achieve maximum results with decreased effort.

Control is not seen as an independent function of Management, but rather as the core definition of Management itself (Bedeian & Giglioni, 1974)

- **General Administrative Theory: Henri Fayol & Max Weber**

Fayol's contribution to Management Theory was that he expanded and broadened the concept of Management to all human activities. He developed a set of universal principles by which effective Management is achieved, no matter the context (Appendix A). The basic approach is to look at the functions of the manager and to see what fundamental "truths" exist in the practice of Management (Koontz, 1961).

Weber developed a theory of authority structures and described the activity within the organization as a function of "authority relations". Weber also used the term *bureaucracy* to describe the "ideal" organization. In a bureaucracy, a clearly defined hierarchy exists with a clear division of labour, detailed rules and regulations and impersonal relationships (Weber, 1946).

- **The Empirical Approach - Ernest Dale's Comparative Method**

Management is the "study of experience". Analyses of previous cases of success or failure produce a database of effective techniques and methods.

The goal is not in extracting universal truths but rather on what has proven successful in practice (Koontz, 1961).

- **Kenneth Boulding's Hierarchy of Complexity**

Boulding set out two routes to developing General Systems Theory (M. C. Jackson, 2009):

1. Develop a theory of general principles applicable to all systems (Von Bertalanffy)
2. Organise and arrange the world into a hierarchy of complexity of organization and to develop the conceptual framework for each level.

Many mathematical and conceptual models of Management are based on this hierarchal view of organization. See Appendix B for a detailed description of Building's Hierarchy of Complexity.

- **Behavioural Management Theory: The Human Resources Approach**

Also known as Behaviour Science, the Human Resources or Human Relations approach introduced a new period in Management thought; namely, the viewpoint that the key to effective productivity lies

within the socio-psychological influences of the work environment on the individual and the group. Some of the protagonists of this view were Dale Carnegie, Abraham Maslow and Douglas McGregor.

Management is centred on interpersonal relationships focuses on the individual and what motivates him or her (Koontz, 1980).

- **Framework for Control: Lyndall F. Urwick**

The beginnings for a structured set of control principles were provided by L.F. Urwick (1943). Defining control as being "concerned with the reaction of persons and materials to the decisions of direction… and with the methods of securing the results of such reactions…"; it is reasonable to use this definition for Management per se (Bedeian & Giglioni, 1974).

- **Cybernetics – Norbert Wiener**

Norbert Wiener, after identifying "communication, closed-loop structures and feedback as pervasive phenomena in both natural and artificial systems", coined the term "Cybernetics". This view of Management centres around a much broader philosophy where the focus is on "information rather than energy". In other words, organizations and the Management thereof, are an application of an outlook that all systems are based on a universal framework (Schwaninger, 2006).

### 2.1.4 Management Science Theory: The Quantitative Approach

Sometimes referred to as operations research (OR), the advent of statistical modelling and other mathematical methods of quantifying Management processes introduced the ability to measure the output of production. This approach stems from the perspective that an objective measure exists within Management Theory and contrary to the HR approach, humans all function, at some primal centre, in the same way. Some of the primary contributors in this field are Charles Babbage, Percy Bridgman, and Stafford Beer.

- **Koontz's formulation of Control Principles**

Following in the footsteps of Urwick's previous formulation, Koontz developed the framework for Management Control, defined by twelve control principles (Appendix C). This clear and comprehensive formulation is often referred to as a "classic of Management literature" (Bedeian & Giglioni, 1974).

### 2.1.5 Late 20th Century to Present

- **Organizational and Environmental Theory - The Systems Approach**

The system approach defines a "system" as a set of interrelated and interdependent parts arranged in a manner that produces a unified whole (Chasteen, 2005). This definition applies to societies, organizations, teams within an organization, or any collection of individual components working towards a common goal.

An organization is an "Open System" in that the system interacts with and depends upon its environment. Moreover, organizational survival depends on successful interactions with this external environment (Robbins, 1983).

This stands contrary to previous approaches which focused inward into the organization and not on the external environment.

- **Stafford Beer and Systems Models**

Stafford Beer believed in the following two assertions (Schwaninger, 2006):

1. "The world is one and so are we."
2. "Reductionism is the rock on which Western science is founded; and it is the self-same rock on which society is founded."

Beer offered concepts and tools for dealing with high levels of complexity, namely:

i. The Viable Systems Model (VSM)
ii. The Team Syntegrity Protocol (TSP)

The details of these are described in more detail in Appendix D.

- **Control Models for Performance Measurement and Management**

Sophisticated methods of achieving control have been developed over past few decades. With the advancements in technology, came a new interface with which managers could gather statistical information on the efficiency of their employees as well measures to both incentivise and discipline the employees to ensure these targets were being achieved consistently. Some of these models are Strategic Performance Measurement Systems (SPMS), Kaplan and Norton's Balanced Scorecard, and Ferreira and Otley's Performance Management and Control Framework (Berry et al, 2009).

Figure 1 below depicts the historical development of Management Theory in terms of the various "schools of thought". Table 2 summarizes the contributions of some of the key figures in Management Theory:

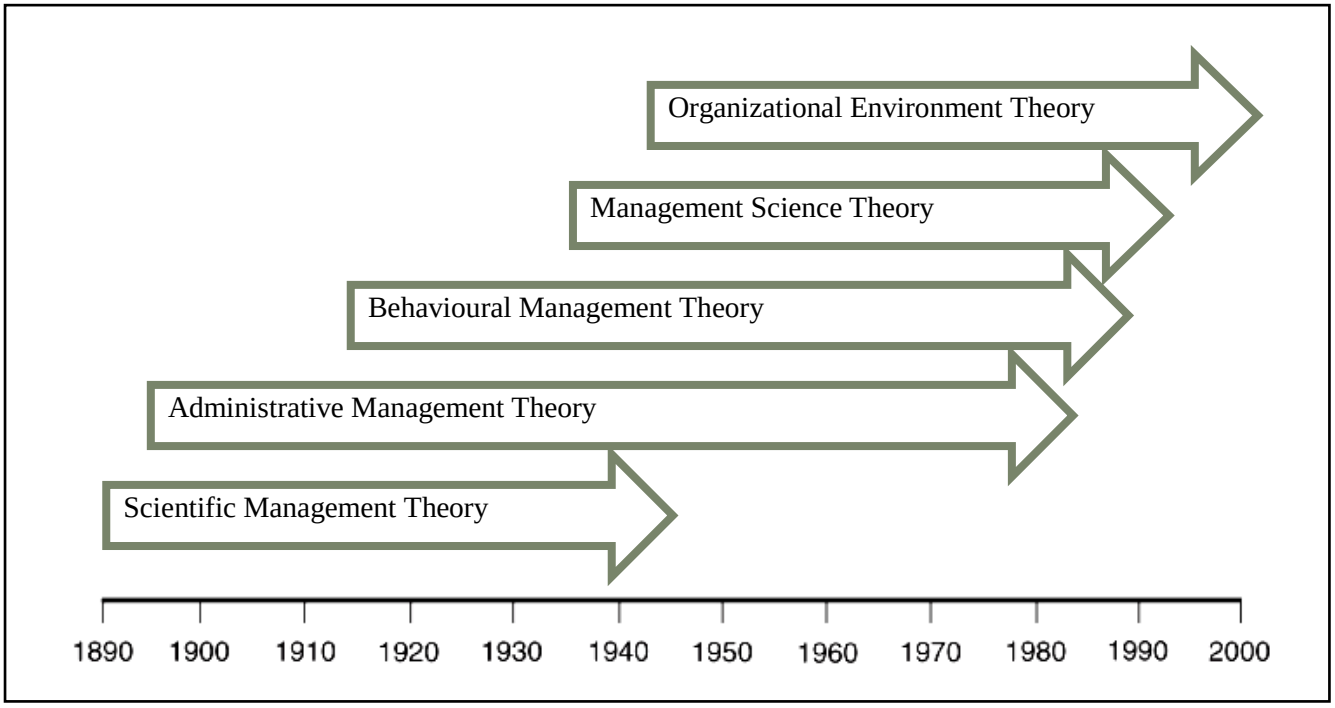



Figure 1: Timeline of General Management Theory

| Contributor | School of Thought | Key Concepts |
|---|---|---|
| Adam Smith | Founding Thinker | Job Specialization |
| Frederick Taylor | Scientific Management | Equality and Investment |
| Harrington Emerson | Control Management | Process Efficacy |
| Henri Fayol | Administrative Management | "Truths" of Management |
| Max Weber | Administrative Management | Authority Structures |
| Ernest Dale | Empirical Management | Case Method |
| Kenneth Boulding | Systems Management | Hierarchy of Complexity |
| Abraham Maslow | Behaviour Science | Human Resources |
| Lyndall F. Urwick | Control Management | Framework for Control |
| Norbert Weiner | Systems Management | Information Flow |
| Harold Koontz | Control Management | Framework for Control |
| Stafford Beer | Systems Management | Cybernetics |
| Ludwig von Bertalanffy | Systems Management | General Systems Theory |
| J.E. Rozenzweig & F. E. Kast | Systems Management | Systems Theory and Organizations |

Table 2: Key Contributors to Management Theory

## 2.2 Arguments within Management Theory

### 2.2.1 Introduction

The following Chapter provides a brief overview of the arguments impacting the field of Management Theory.

It is important to note that the arguments presented below are summarized for the benefit of the reader and do not contain the complex details of each argument. The reader is encouraged to refer to the sources mentioned for a detailed discussion of each topic.

The purpose of the following overview is to provide a perspective on the current status of Management Theory and the challenges facing the application of the theories into practice.

### 2.2.2 Lack of a Unified Theory of Management

The term "Management" is relevant in almost every context. Each and every industry, indeed each and every organization of people or tasks, requires effective Management in order to effectively exist.

The first challenge facing the development of a theory of Management, or any body of knowledge for that matter, is the definition of the body of knowledge itself.

In other words, what is the scope of the field of Management? What does this scope include or exclude? What are the variables being investigated? What are the outcomes being measured?

This challenge has proven to be the most difficult in terms of Management theory. This is due to its breadth of relevance to each and every profession and institution.

The outcome of this challenge thus far has been the following (Alton, 1967; Koontz, 1961; Pollock, 2000):

1. Disputes on what the term "Management" means
2. Varying definitions and inconsistent terminology
3. A lack of synchronization between industries or fields of research i.e. Each faculty wants to develop its own body of knowledge

These are but to name a few. In any event, the future of Management theory and in particular, its relevance to the practitioner, depends heavily on the unification of the theory into a single, defined body of knowledge.

### 2.2.3 Management Reality is Too Complex

The attempt to qualify or measure the Management process is made extremely difficult by the single fact that the primary variable is the human being. In other words, Management is concerned with the proper and effective use of the human being in order to achieve a desired output. "In the organization, the individual is both goal and means." (Hofstede, 1978)

In Boulding's Hierarchy of Complexity, humans and organizations occupy the second-highest level of complexity (Hofstede, 1978): "[It] is fundamentally impossible for the human brain to grasp what goes on [on this level]."

Many argue that Management Theory is fundamentally flawed in that it reduces Management reality to a much lower level of complexity and in so doing, makes the theory itself irrelevant to practical application.

### 2.2.4 Management Theories are "Over-Scientific"

The venture of making Management into a science questions the place of the humanistic or ethical component in achieving desired output. In other words, what ethical responsibility does Management theory have towards society and the individual?

A pure mathematical or scientific perspective would argue that the organization must achieve maximum performance (or profit) in order to be defined as "successful". Sociologists would disagree and argue that the organization has an ethical and social responsibility to each individual as well as the society at large. The measure of success would therefore be the overall effectiveness of how the organization achieves maximum output whilst maintaining maximum quality of life for its employees and the society it serves (Ghoshal, 2005).

### 2.2.5 Management Theories Apply Only in a Limited Context

The basis of any mathematical model is the basic assumptions that are made in order to derive a set of first principles for the model.

The assumptions made in deriving the theory of Management are controversial in light of the following:

i. These assumptions are not always valid (Hofstede, 1978).
ii. Different systems are missing one or more of these basic assumptions (Hofstede, 1978).
iii. The basis for these assumptions is controversial within itself. In other words, depending on how the organization or system is viewed, the assumptions needed for the model will differ significantly. A clear example if this is found in the unirational versus multirational view of Management control (Dermer & Lucas, 1986).

### 2.2.6 Management vs. Control

Perhaps the most significant development of the modern Management era is the concept of self – regulating systems as opposed to control systems, where the units within the system are controlled (managed) closely to produce the desired output. The units themselves are viewed as nothing other than mechanical components in the system.

Management Control is not concerned with the interrelations between the parts, or the socio-political factors involved in the system. It is also not concerned with outputs or any other variables which are not measurable. This of course is contrary to the sociological perspective on Management.

### 2.2.7 Management Theories are Not Scientific Enough

In contrast to the argument presented in Chapter 2.2.4, the argument is put forward that there is also an under-emphasis on scientific method on the part of the social scientists. The difficulty with applying the socio-political view of Management is that the theory lacks a certain 'objectivity' and becomes subject to opinion and relativity (Alton, 1967).

The pursuit of uniformity and truth within Management theory provides direction towards a theory or framework that applies in every context and is also universally accepted as the benchmark for successful Management.

### 2.2.8 Cultural Factors

An important criticism of current Management theories is that they do not account for cultural relativity.

Cultural factors are believed to be very significant in determining the correct managerial approach and practices which prove successful in some countries may prove detrimental in others (Alton, 1967; Czinkota, 1983; Hofstede, 1980).

These factors are not only inter-national (between countries or regions) but are also intra-national in that many societies contain various cultural or ethnic groups. This is found in countries such as South Africa, where there are many different racial groups and varying influences are present even within a single racial group (Czinkota, 1983).

### 2.2.9 Shortage of "Interesting" Research

The explosion of interest in Management theories as brought a substantial increase in the number of Management papers published in the last few decades.

However, this phenomenon has not yielding the fruits that were hoped for. Rather the result being what is commonly known as "gap-spotting" (Alvesson & Sandberg, 2013).

Building primarily on earlier works, gap-spotting is defined as the identifying of gaps within these works (or research) and investing investigative effort into the gaps rather than the body of knowledge itself.

"Higher impact" or "interesting" studies are termed as such in that they challenge the critical assumptions made within the theory of study and bring with it a certain revolutionary change in the way the subject is viewed.

The future of Management theory depends on the constant and consistent evolution of the subject. Gap-spotting is a very dangerous and viral pattern that stunts the growth of the field, ultimately leading to its becoming obsolete and irrelevant.

### 2.2.10 Closed vs. Open Systems

Perhaps the most fundamental debate about Management, the question of whether to view an organization as a "closed" or "open" system has influenced most theories about Management (Bedeian & Giglioni, 1974; Brown, 1966; Johnson, 1964; Kast & Rosenzweig, 1972; Mele et al, 2010; Von Bertalanffy, 1972).

A brief definition is provided below, however a more comprehensive discussion of the subject is found in Chapter 2.4.

An Open System is a system which allows for interactions between its internal parts and the external environment. Closed Systems on the other hand, do not interact with the external environment and are usually categorised by negative feedback loops (Figure 2).

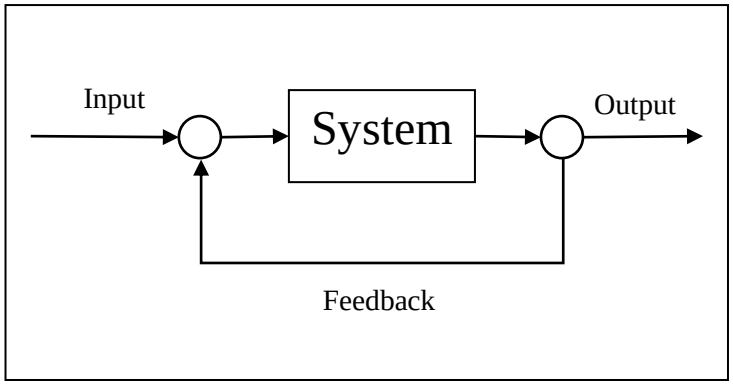



Figure 2: Negative Feedback Loop

### 2.2.11 Emphasis of the External Environment

A follow up discussion to the debate of Open vs. Closed Systems is the issue of how much emphasis is placed on the influence of the external environment.

We have noted above that the difference between an Open and a Closed System is whether the external environment influences the system and is therefore included in the definition or scope of the system (or organization).

The debate today seems not to be on whether a system is 'completely' closed or open but rather on the extent to which the external environment influences the output of the system.

For example, no one would argue that an organization is not influenced by its external environment (competitors, regulatory changes, world economy, etc.), however, when attempting to develop a theory for Management, the emphasis on the external environment, and more precisely how to accommodate for this variable in the Management model, is brought into question (Alton, 1967).

## 2.3 Application: Management Theory in South Africa

### 2.3.1 Introduction

The recent tragedy at the Marikana platinum mine, where striking union workers clashed with police after failed negotiations with Management at the mine (34 miners were killed in the conflict), has put the spotlight on Management practice in South Africa (Appendix E). The incident has also shed light on the state of the relationship between workers and Management, in particular, amongst union workers.

Union activity, especially striking, is widespread within South African organizations and marking almost 10 years since the African National Congress obtained democratic control of the country, the question of why there is such conflict between workers and Management is gaining potency.

Recent studies have shown that there is still a very high percentage of white (Caucasian) managers at top executive levels in comparison with their coloured counterparts (Juggernath, 2013). The BEE (Black Economic Empowerment) initiative, also known as Affirmative Action, introduced in 2007 and aimed at undoing some of wrongs of the Apartheid regime by introducing quotas for coloured positions (and company ownership) within corporations, is somewhat still in its infancy and large corporations are still predominantly "white-managed" (Booysen, 2007; Maboho, 2014; Myres, 2014).

Many initiatives, special investigative programs, as well as substantial academic research, have been employed in an attempt to understand the underlying reasons for this lack of synchronicity, and in most cases conflict between Management and staff. Various measures have also been suggested to resolve these issues. The ensuing paragraphs present an overview of the common issues found within academic journals.

### 2.3.2 Managers are Aloof

Studies have found that employees feel that Management are aloof and do not share on open platform with the 'common' staff (Human, 1996). A sense of class-distinction is felt where the staff perceive the Management to see themselves as aristocratically superior and unable to relate to the issues relevant to the 'plebeian' staff members (Booysen, 2007; McFarlin, Coster, & Mogale-Pretorius, 1999). It is important to note that the research has also shown that both Black and White managers display this type of aloofness, or what others refer to as "Power Distance" (Booysen, 2007). This "distance" in turn can create an alienation of the Management within the broader employee component and inhibit the establishment of shared goals within the organization (Donaghey & Cullinane, 2011).

### 2.3.3 Open Communication and Language

In African culture, open face-to-face communication is an important aspect of respect and dispute resolution (Karsten & Illa, 2005; McFarlin et al., 1999). Company policies made behind "closed doors" are seen as disrespectful and as a sign of unwillingness to find common ground (McFarlin et al., 1999). Analysts have identified the need for open communication on an equal playing ground to resolve conflict with South African organizations (Human, 1996; RD Johnson, 2010; Karsten & Illa, 2005; McFarlin et al., 1999; Poovan, 2006).

Language also plays an important role in contributing to challenges in communication. The fact that South Africans have varying first languages often leads to miscommunication and misunderstanding, in the workplace. This type of conflict also strengthens the cultural divide between social groups (Human, 1996; RD Johnson, 2010; Karsten & Illa, 2005).

### 2.3.4 Social Attitudes Leading to Conflict

"Observable workplace behaviour is strongly influenced by latent, unobservable social attitudes." (Mangaliso, 2001) White managers do not understand the implications of this social milieu towards their Black employees, thereby creating a series of miscommunications which often lead to conflict or inefficiencies within the organization (RD Johnson, 2010; Luthans, 2004; McFarlin et al., 1999).

### 2.3.5 Individualism and Collectivism

The distinction between Individualism and Collectivism plays a very important role in South African organizations. This issue is also categorised as the issue of "different regard for people" (Jackson, 1999).

Jackson describes the difference between these two concepts as follows: "Individualism stresses self-interest and an instrumental relationship with others, particularly in organizational relationships, whereas collectivism stresses an obligation-based relationship often associated with kinship and group membership, but where relationships with out-group members can be regarded as instrumental." (Jackson, 1999)

Research shows that African workers do not display a collective loyalty, or shared values, towards the organization stemming from the lack of collective decision making. This is the view that Management decisions are sent from somewhat of an "ivory tower" (Colff, 2003; Luthans, 2004; Lutz, 2009; McFarlin et al., 1999).

### 2.3.6 Investment in People

Evidence has shown that South African organizations are disinvesting in people (T. Jackson, 1999). This is evident in the shortage of internal training programmes, staff turnover statistics and the lack of promotions within organizations amongst lower wage earners (Human, 1996).

### 2.3.7 BEE and Skills Shortage

The attempt to strike the balance between the shortage of skills and general deficiency in skills, with Affirmative Action placements is continuously being challenged (Colff, 2003; Horwitz & Browning, 2002). On the one hand, placing coloured staff in positions where their white counterparts are better qualified places additional stress and mistrust between the different ethnic and racial groups (Horwitz & Browning, 2002; T. Jackson, 1999). On the other hand, the legacy of the Apartheid system has left the country void of a significant educated coloured professional population. Organizations need to be incentivised to hire coloured workers in order for this gap to be reduced (McFarlin et al., 1999).

### 2.3.8 Performance Measurement

Western Management theories are based on the premise that performance is measureable and therefore result-based (T. Jackson, 1999). The measure of achievement or the lack thereof, is often a cause for dispute between managers and staff (Mathauer & Imhoff, 2006). This is due to the fact that

African cultures place far less emphasis on individual performance or 'success' than on communal achievement (Booysen, 2001). As such, applying performance measures on African individuals can potentially create animosity towards Management, if not communicated correctly. The perception is created that Management is 'unfair' or bias towards a particular individual or group of individuals (Mathauer & Imhoff, 2006).

### 2.3.9 Recommendations for Solving Management Challenges in South Africa

In response to the challenges facing organizations in South Africa detailed above, many authors have offered suggestions and recommendations aimed at resolving these challenges. These have been categorized as follows:

- Adopting a more "Afrocentric" view of Management

Many researchers have already identified the difficulties ain applying the "Western" or "Eurocentric" models of Management towards an African environment. As such, they have identified the need for an "Afrocentric" model of Management which embraces the cultural and social aspects of the African population. This model is referred to by most, if not all, as *Ubuntu* Management (Colff, 2003; Lutz, 2009; McFarlin et al., 1999). This term "Ubuntu" is defined later in Chapter 4.2. The main distinction between Eurocentric and Afrocentric models, is the focus on the community, or collective whole, that is the organization, as opposed to an organizations comprised of individuals having to achieve a certain acceptable level of performance (Human, 1996; T. Jackson, 1999; Kamoche, 2002; Lutz, 2009).

- Valuing Diversity

Many of the challenges mentioned above come as a result of the unique diversity of the South African population. This diversity is the backdrop for the country's historical challenges as well i.e. Apartheid, and is seen by many as the main obstacle facing any organization in South Africa (Booysen, 2007). However, researchers have found that not only are these challenges possible to overcome, this diversity can indeed be a source of pride and motivation for the employees, and in fact the foundation of a successful Management forum in the organization (Kamoche, 2002; Luthans, 2004; Poovan, 2006). Companies that are able to inculcate a sense of pride in diversity, or valuing diversity, can reach a very high level of efficiency, motivation and produce a highly effective workforce (Booysen, 2001; T. Jackson, 1999; Luthans, 2004; Poovan, 2006).

- Creating a holistic corporate identity and vision

In moving towards a more Afrocentric, or communal, structure of Management, the strategy needed to be successful in implementing such a system must be "holistic". In other words, a much broader view of the organization needs to be taken, where policies and programs need to address the entirety of the organisation, infusing all of its operational structures with this sense of community and collective vision (McFarlin et al., 1999; Thomas & Bendixen, 2000).

- Instilling trust and shared values

No model of Afrocentric Management can ever be deployed without first establishing a strong foundation of trust and shared values within the organization (Colff, 2003; Karsten & Illa, 2005; Mangaliso, 2001; Ncube, 2010; Poovan, 2006). Due to the pre-existing social tensions that centre on perceived inequality and injustice within the organization, it is imperative that the Management body create an open and inclusive forum for employees to have a voice. Once achieved, this same forum will then be used as the foundation for building trust between Management and staff, as well as between the various social and racial groups within the organization. This in turn, enables this now 'community', to achieve a shared vision with shared and collective values (Booysen, 2001; T. Jackson, 1999; Karsten & Illa, 2005; Ncube, 2010).

- Measuring and rewarding collective performance

As mentioned above, the Western or Eurocentric style of Management places high emphasis on measuring and rewarding individual performance. Moving towards an Afrocentric model requires this paradigm to be shifted towards a broader communal measuring of performance. Researchers have highlighted the need for a "team structure" to be the model for such, where performance is measured by the group's achievements. The manager's responsibility in this case, is to harness the team's full potential and use each individual's specific skills to achieve a communal goal (Booysen, 2001; Mathauer & Imhoff, 2006; McFarlin et al., 1999; Poovan, 2006).

- Skills development and encouraging personal development

The shortage of professional skills in South Africa is recognized unanimously. This void must be filled by placing high emphasis on skills development programs, as well as creating an encouraging and motivating environment in which employees feel inspired to excel in their positions, but also to work hard in pursuit of promotion within the organization (Booysen, 2007; Bush, 2007; Luthans, 2004).

- Establishing an effective platform for communication

The diverse culture and ethnicity of South Africa creates an enormous challenge to have effective communication within an organization. Language, cultural and social norms, as well as historical prejudice and perceived prejudice, all contribute negatively towards this challenge. In an Afrocentric environment, an open and effective platform for communication must exist between the various groups of the organization. This platform must be able to cater for the various cultural and ethnic 'subtleties' as well as being fair and unbiased towards a particular ethnic or social group (McFarlin et al., 1999).

## 2.4 The Control Model

### 2.4.1 Introduction

This Chapter provides a brief overview of the Control Model as it is represented within mathematical theory. The model discussed here will be represented by the Closed-loop System model (refer to Chapter 2.2.10) as shown in Figure 5. The description of this model will attempt to follow, as much as possible, a non-mathematical flow with the assumption that the reader is from a non-mathematical background.

### 2.4.2 Fundamentals of Feedback

In order to understand the necessity for feedback in complex systems, the fundamentals of feedback are explored in the most common engineering context, namely: Control Systems.

### 2.4.3 Background to Control

"Your body temperature, unless you are ill, remains almost constant regardless of whether you are in a cold or hot environment. To maintain this constancy your body has a temperature control system. If your temperature begins to increase above the normal you sweat, if it decreases you shiver. Both these are mechanisms which are used to restore the body temperature back to its normal value. The control system is maintaining constancy of temperature. The system has an input from sensors which tell it what the temperature is and then compares this data with what the temperature should be and provides the appropriate response in order to obtain the required temperature." (Bolton, 2003)

Control systems are found everywhere, from the air conditioning unit at the office to the digestive system. Control systems are also not limited to physical processes, the processes of logical deduction is also based on control concepts. The applications of control and control systems are endless.

"In the most abstract sense, it is possible to consider every physical object a control system. Everything alters its environment in some manner, if not actively then passively – like a mirror directing a beam of light shining on it at some acute angle. The mirror (Figure 3) may be considered an elementary control system, controlling the beam of light according to the simple equation "the angle of reflection $\alpha$ equals the angle of incidence $\alpha$ "." (Di Stefeano et al, 1995)

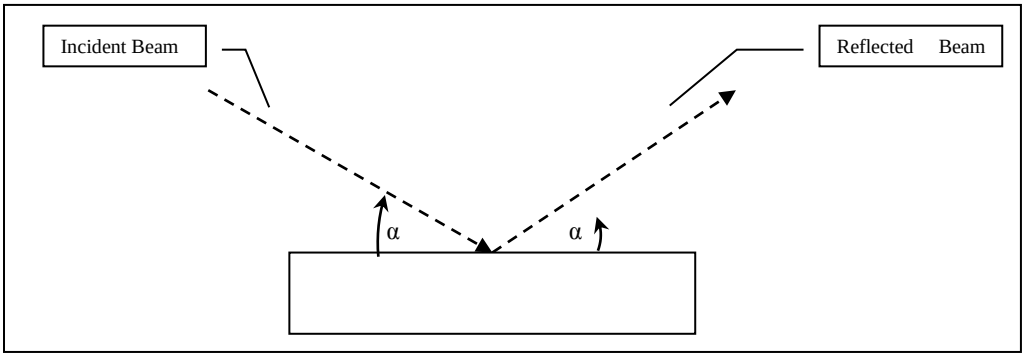



Figure 3: Mirror directing a Beam

### 2.4.4 Fundamentals of Control Systems

- **Classification of Control Systems** (Di Stefeano et al., 1995)

Control Systems are classified into two general categories: *open-loop* and *closed-loop* systems. The distinction is determined by the control action, which is that quantity responsible for activating the system to produce the output.

Definition: An open-loop control system is one in which the control action is independent of the output.

Definition: A closed-loop control system is one in which the control action is somehow dependent on the output.

Two outstanding features of open-loop control systems are:

1. Their ability to perform accurately is determined by their calibration. To calibrate means to establish or re-establish the input-output relation to obtain the desired system accuracy.
2. They are not generally troubled with problems of *instability*, a concept to be subsequently discussed in detail.

Closed-loop control systems are more commonly called feedback control systems, and are considered in more detail in the next Chapter.

In order to classify a control system as open-loop or closed-loop, the components of the system must be clearly distinguished from components that interact with, but are not part of the system. For example, a human operator may or may not be a component of a system.

Example 1:

An automatic toaster is an open-loop control system because it is controlled by a timer. The time required to make "good toast" must be estimated by the user, who is not part of the system. Control over the quality of toast (the output) is removed one the time, which is both the input and the control action, has been set.

Example 2:

An autopilot mechanism and the airplane it controls is a closed-loop (feedback) control system. Its purpose is to maintain a specified airplane heading, despite atmospheric changes. It performs this task by continuously measuring the actual airplane heading, and automatically adjusting the airplane control surfaces (rudder, flaps etc.) so as to bring the actual airplane heading into correspondence with the specified heading. The human pilot or operator who presents the autopilot is not part of the control system.

- **Feedback** (Di Stefeano et al., 1995)

Feedback is that characteristic of closed-loop control systems which distinguishes them from open-loop systems.

Definition:

Feedback is that property of a closed-loop system which permits the output (or some other controlled variable of the system) to be compared with the input to the system (or an input to some other internally situated component or subsystem of the system) so that the appropriate control action may be formed as some function of the output and input.

More generally, feedback is said to exist in a system when a closed sequence of cause-and-effect relations exist between system variables.

In essence, every passive system (one containing no energy sources) may be viewed as a feedback system.

The original example of regulating body temperature is an example of feedback control; signals are fed back from the output, i.e. the actual temperature, in order to modify the reaction of the body to enable it to restore the temperature to the "normal" value. Feedback control is exercised by the control system comparing the fed back actual output of the system with what is required and adjusting its output accordingly. Figure 4 illustrates this feedback control system. (Bolton, 2003)

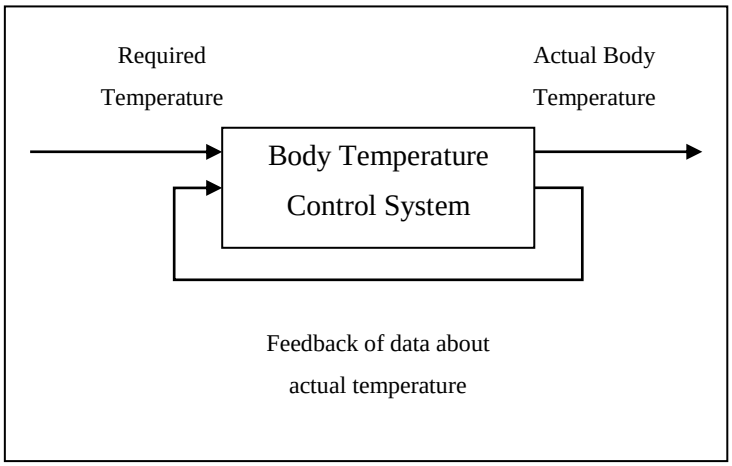



Figure 4: Feedback control for human body temperature

- **Basic Elements of a Closed-loop System** (Bolton, 2003)

Figure 5 shows the general form of a basic feedback system. It consists of the following elements:

1. Comparison element

   This compares the required reference value of the variable condition being controlled with the measured value of what is being achieved and produces an error signal. It can be regarded as adding the reference signal, which is positive, to the measured value signal, which is negative in this case:

   *Error Signal = Reference value signal – Measured value signal*

2. Control Element

   This decides what action to take when it receives an error signal. It may be, for example, a signal to operate a switch or open a valve. The control plan being used by the element may be

just to supply a signal to switch on or off when there is an error, as in a room thermostat, or perhaps a signal which proportionally opens or closes a valve according to the size of the error. Control plans may be hard-wired systems in which the control plan is permanently fixed by the way the elements are connected together or programmable systems where the control plan is stored within a memory unit and may be altered by reprogramming it.

3. Correction Element

The correction element produces a change in the process to correct or change the controlled condition. Thus it might be a switch which switches on a heater and so increases the temperature of the process or a valve which opens and allows more liquid to enter the process. The term actuator is used for the element of a correction unit that provides the power to carry out the control action.

4. Process Element

The process is what is being controlled. It could be a room in a house with its temperature being controlled or a tank of water with its level being controlled.

5. Measurement Element

The measurement element produces a signal related to the variable condition of the process that is being controlled. It might be, for example, a switch which is switched on when a particular position is reached.

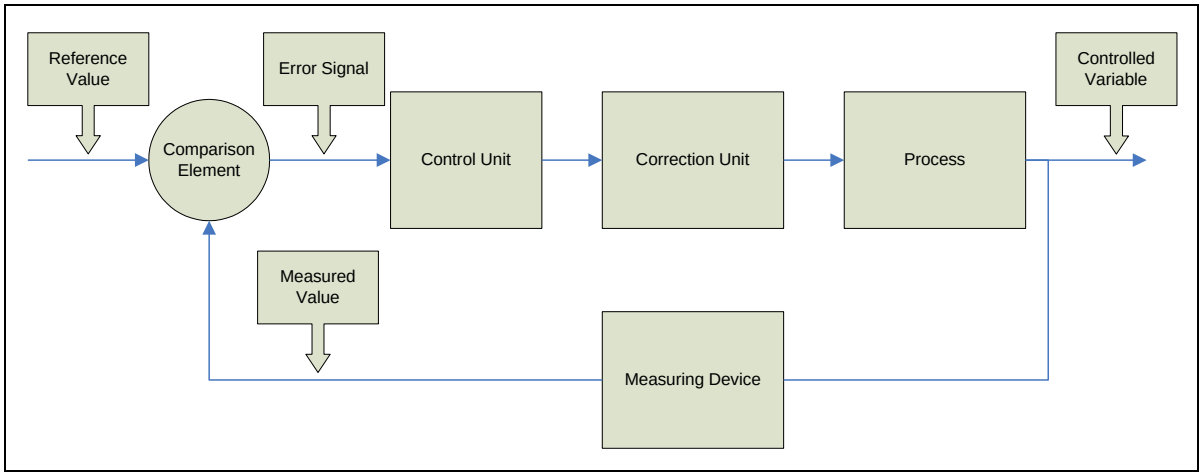



Figure 5: The Elements of a Feedback Control System

- **Characteristics of Feedback** (Di Stefeano et al., 1995)

The most important features the presence of feedback imparts to a system are the following:

1. Increased accuracy. For example, the ability to faithfully reproduce the input
2. Reduced sensitivity of the ratio of output to input to variations in system characteristics
3. Reduced effects of non-linearities and distortion
4. Increased bandwidth. The bandwidth of a system is that range of frequencies (of the input) over which the system will respond satisfactorily
5. Tendency toward oscillation or instability

Additional characteristics of feedback systems are (Bolton, 2003):

6. Lag

   In any control system there are lags. Thus, for example, a change in the condition being controlled does not immediately produce a correcting response from the control system. This is because time is required for the system to make the necessary responses. For example, in the control of the temperature in a room by means of a central heating system, a lag will occur between the room temperature falling below the required temperature and the control system responding and switching on the heater. This is not the only lag. Even when the control system has responded there is a lag in the room temperature responding as time is taken for the heat to transfer from the heater to the air in the room.

7. Steady-state Error

   We might get an error signal to the controller occurring as a result of the controlled variable changing or a change in the set vale input. The term *steady-state error* is used for the difference between the set value input and the output after all transients have died away. It is thus a measure of the accuracy of the control system in tracking the set value input.

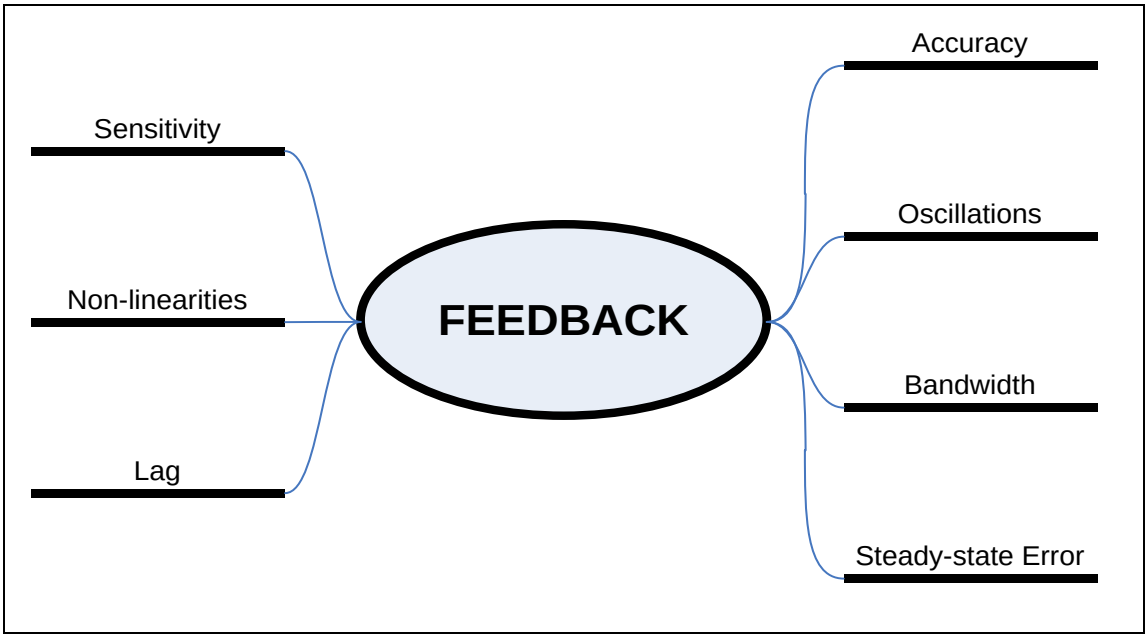



Figure 6: Characteristics of Feedback

## 2.5 Conclusions

The reader has been presented with an overview of the historical development of Management Theory, as well as the debates and arguments within Management Theory. This overview was aimed to familiarise the reader with the extensive subject that is Management Theory and in particular, the challenges facing the academic community in the application of these theories and models.

A brief outline of the issues facing Management Theory in South Africa has also been presented. These issues are 'uniquely South African' in that they stem from the milieu of social and racial diversity that exists in South African society.

The Control Model of Engineering Systems has been introduced in order to provide a review of the fundamentals of the model. This model will be discussed from the viewpoint of Management Theory in a later chapter.

The ensuing chapters will develop some of the ideas and concepts mentioned above and introduce the approach to resolving some of the challenges facing Management Theory as a whole, and in particular, Management in South African organizations.

# 3 METHODOLOGY

## 3.1 Introduction

The following Chapter describes the research methodology applied in this dissertation. In turn, this addresses the aims that the research hopes to attain, as well as the specific design adopted to facilitate this task.

The selection of the research data is described as well as the considerations that were taken in the selection of the data pool or source. The resulting limitations in the applicability of the research outside of the assumed scope of research are also described.

Any assumptions that impact on the analysis are detailed in order to provide the reader with the relevant information to clarify the perspective from which the research was made.

## 3.2 Context of the Research

Previously, it was stated in Chapter 1.1 that the author was bothered by the seemingly disproportional emphasis of non-academic works and publications in the study of Management and in particular, the popularity of biographical accounts of Management experiences. This 'discomfort' has led to the investigation of the history of Management Theory and the challenges facing this institution (Chapter 2.1, 2.2).

In addition, the author has paid particular attention to the subject of Management Theory and its practices in the Republic of South Africa (Chapter 2.3). Besides being the author's country of residence, the subject of Management Theory in South Africa, being a developing country as well as a multi-cultural and diverse country, presents a unique case study for the 'relevance' of Management Theory. The environment that is post-Apartheid South Africa is an excellent candidate to take Management Theory and so-to-speak "put it through its paces". The challenges facing Management Theory in South Africa are both numerous and multi-dimensional, covering both areas of the sciences and humanities.

The author's background in Engineering, and specifically Engineering Control, led to an observation that many similarities are shared between Management Theory and Control. A hypothesis was formulated that Control Theory and its associated 'tools' could be applied more extensively to Management scenarios and perhaps resolve some or many of the challenges facing Management Theory itself and in particular, Management Theory in South Africa.

Due to the nature of the subject matter, the approach selected for this task is based on the Grounded Theory of Qualitative Research. The theory suggests that an iterative process can be applied to an analysis whereby general or generative questions can be raised about the topic, guiding the direction of the investigation. As the observations are made and data is gathered, one is able to begin identifying *core theoretical concepts*. Links, or *Linkages*, are then posited between these core concepts and the data, leading to a theorisation of the topic until a new observation leads to a new conclusion about the topic. The cycle is then repeated until such time that the theory is able to 'cope' with any new data found within the research (Glaser & Strauss, 1967).

The line of reasoning followed in this dissertation is based upon the hypothesis that linkages could exist between core concepts taken from Control Theory and the discussions and conclusions found in academic publications on the topic of Management Theory. As such, a review of literature was conducted to assess if there are grounds for this hypothesis. In order to expand the research beyond purely theoretical or conceptual value, the decision was taken to investigate the subject of Management Theory in South Africa. This in turn, would provide a context for the application of the theoretical concepts and provide some validation for these assertions.

## 3.3 Research Objectives and Assumptions

In the previous chapters, the history of Management Theory was explored and an overview was given of the main challenges confronting this field of study. These challenges revolve around the formulation of a theory of Management which is able to address the practical realities of the Management environment. Amongst the many suggestions and recommendations proposed by the various personalities, the question remains – what is the common 'thread' amongst them? In other words, what is common amongst the various schools of thought that could be the basis for the resolution of these challenges? The first aim of this study is therefore to identify the 'common ground' that may exist between the various academic institutes on the subject of Management Theory. This understanding may then provide the insights needed to begin formulating a strategy aimed at solving the challenges facing Management Theory.

A primary assumption is made that the way in which these challenges will be ultimately resolved is through achieving a sense of 'unity' within the academic community. Although this notion is supported by Koontz, Hofstede and others (Hofstede, 1978; Koontz, 1961, 1980), the author is still inclined to recognise this as an assumption.

The second aim of this study is to make a practical contribution to the resolution of the challenges facing Management Theory in South Africa. In the previous chapter, it was argued that South Africa is uniquely positioned in terms of Management dynamics and is diverse to the extent that it possesses its own 'variables' of Management. As such, if Management Theory is to secure its place in the academic canon, it must also be robust enough to 'handle' the difficulties facing Management in a complex environment such as South Africa. In addition, due to the author's nationality, the author is motivated to contribute towards helping build successful Management practices within South African organizations and help improve the quality of life for all South Africans.

Lastly, the previous chapter presented an overview of Engineering Control as it relates to the model of Feedback systems. The purpose of this is twofold: First, the model forms part of the basis for the scientific theory of Management (Kast & Rosenzweig, 1972; Koontz, 1961; Taylor, 2004). Second, although the model is used primarily in a pure 'mathematical sense', it is a model based on a holistic or generalist view of systems. In other words, the model was developed as a structure for any system, no matter what the application – commonly known as Systems Theory (Boulding, 1956; M. C. Jackson, 2009; Kast & Rosenzweig, 1972; Mele et al., 2010). This study aims to explore the nature of this model and achieve a better understanding of its conceptual framework – the core concepts that define this unique and distinct model.

## 3.4 Research Considerations

Due to the broad and conceptual nature of the subject matter of this study, the following considerations were taken into account:

### 3.4.1 Overview of Management Theory

The study of 'Management' as it is commonly known, spans over a century and has been the subject of an enormous volume of research. It is therefore unrealistic to attempt to cover the entire spectrum of this subject in this study. To claim that the work presented in this dissertation is a comprehensive account of the entire gamut of Management Theory, would be an injustice to the efforts made by the countless contributors to this field. Therefore, a particular selection is made in this study in the overview of the historical development of 'Management thinking' from the perspective of a 'systems' or 'holistic' standpoint. In addition, the overview of the challenges facing Management Theory is also a selection of specific topics that are linked to this same 'systems' perspective on the topic. There are other challenges which need to be addressed by those invested in the development of Management Theory; however these are not addressed in this study (See Chapter 5 for a more detailed discussion on this point).

### 3.4.2 Management in South Africa

The topic of ‘Management’ as it relates to its application in the context of South African organizations and other environments is again vast and complex in nature. This study is not able to cover the subtle complexities of the various Management issues in their entirety. A selection of topics is therefore made of the ‘common’ or ‘fundamental’ discussions that relate to Management challenges in South African environments.

### 3.4.3 Control Theory

The author is obligated to consider that the reader is not necessarily familiar with topics in Engineering and therefore must provide the background for Control Theory from a perspective that is as ‘non-mathematical’ as possible. Whilst it implausible that a ‘scientific’ subject be discussed without the mathematical content, the principles governing the models of Control and Feedback are in essence ‘conceptual’ on a fundamental level. The principles on which the models are founded can indeed be described without the need for complex mathematical equations, formulae, etc. It is also noted that the use of Control Theory relies on a quantitative derivation of a model, based on the principles of said theory. In order to achieve this derivation, the system under scrutiny must first be defined. The author has chosen an approach where the conceptual underpinnings of the ‘basic’ Control framework are used as an analogy for a well-functioning system. The “Control Strategy” employed would therefore be based on this model. The intention here is to establish a perspective on Management that is based on Control ‘philosophy’ and not necessarily on establishing a Control model for Management.

## 3.5 The Unit of Study and Sample

In this study, two types of texts were analysed, namely journal articles and books. Journal articles were identified through computerized library searches using electronic databases such as Emerald, Sage and Researchgate. Google Scholar was also used to identify relevant journal articles.

The keywords and key-phrases used in the search were “history of Management theory”, “systems theory and Management”, “Management theory in South Africa”, “Ubuntu Management”, “Control Theory and Management”, and other permutations of these keywords.

The journal articles were selected on the basis of full-text availability i.e. the full article text being available to be viewed.

The articles were then sorted into the following categories based on date of publication, article title and a review of the abstract Chapter of the article:

- Systems Theory and Management
    - History
    - Concepts
- Control Theory and Management
    - History
    - Concepts
- Challenges affecting Management Theory
    - Pre-1970
    - 1970-1999
    - Post-1999
- Management in South Africa
- Feedback Control Theory

The articles relating to challenges facing Management Theory were divided into three date categories[13]: (1) Pre-1970, (2) 1970-1999 and (3) Post-1999. This was done in order to establish any evidence of 'progress' in the resolution of these challenges.

In addition to journal articles, some textbooks were also selected on the basis of them being able to provide more detailed or comprehensive insight than the journal articles. Whilst this was rarely the case, some books provided a 'broader' perspective on the respective topics due to them being greater in length than their journal article counterparts.

Once the various texts were sorted and organised, a critical analysis of the 'data' was then performed. The critique was guided by the following argument structure:

**Management Theory**

- Who are the founding thinkers of Management Theory?
    - What are the key concepts being defined by this author?

[13] These date ranges were chosen for their respective places in the timeline of 'modern technology'. Pre-1970 being the era before technologies, such as the microprocessor, were invented. 1970-1999 being the era when these technologies were being invented but not yet developed to be able to be mass-marketed. Post-1999 is the era in which modern technologies are now very commonplace and form an integral part of every society on our planet.

- Are there any recognised groups or divisions within Management Theory?
    - Which authors belong to which group?
- What are the common agreements or disagreements within Management Theory?
    - What suggestions or recommendations are made to deal with these disagreements?

**Management in South Africa**

- Who are the contributing researchers in the topic of Management in South Africa?
    - What are the common issues being emphasised by the various authors?
    - Is there any common 'thread' or 'theme' in these discussions?
- What are the proposed solutions being offered to resolve these challenges?
    - Is there any common 'thread' or 'theme' in these discussions?

**Control Theory**

- What is the most basic form of the Control Model in Engineering?
- What are fundamental concepts or principles defining this model?
    - Are there any similarities or *linkages* between these concepts and those identified in the 'data' on Management Theory?
- What are the key assumptions made in the Control Model?
    - Do these assumptions highlight any specific characteristic of an effective Control system?
    - Do these characteristics provide any insight into the nature of systems as a whole?
    - Can these insights assist in resolving any of the challenges facing Management Theory as a whole, or Management challenges in South Africa?

## 3.6 Research Findings

The resulting analysis of the 'data' described above, yielded the following results, categorized by each sub-Chapter:

- Management Theory

The history of Management Theory seems to be accepted by the academic community as following a particular evolutionary path. Most authors describe a similar chronology of the milestones achieved through the historical timeline and most identify the same personalities as being the key contributors to that particular milestone or 'step' in the timeline. Whilst some mention certain personalities and

omit others, these differences pertain to the particular author's identifying with a specific group of Management philosophy.

The critiques or criticisms of Management Theory provided a spectrum of differing opinions and perspectives on the issues facing this field of study. Whilst some authors describe a certain scepticism about the practical relevance of Management Theory (Ghoshal, 2005; Hofstede, 1978; Pfeffer, 2005; Thorpe, 2004), many offer a more 'hopeful' stance on the future of the subject (Hewege, 2012; Hofstede, 1978, 1993; Koontz, 1961, 1980; Miller & Tsang, 2011; Thorpe, 2004).

A few common or shared views were identified in terms of a finding ways to resolve some of the challenges facing Management Theory. These authors described the unification or 'unity' of the various groups or 'schools' within the academic community, as being the starting point for forming a collective body of "Management Thinking" (Kast & Rosenzweig, 1972; Koontz, 1961; Pollock, 2000). The details of this 'unification' were described in varying forms - for example, some refer to the adoption of a "multi-disciplinary approach", incorporating theories from various fields (Hewege, 2012) - however the underlying message being that, first and foremost, 'unity' is required before any progress can be made in this regard.

- Management in South Africa

The discussions surrounding Management in South Africa are based on the premise that 'cultural factors' play a significant part in determining the "correct" Management practices that are appropriate for a particular environment. Although somewhat controversial, this premise forms the basis for the opinion that Management Theories need to be adapted to the cultural and ethnic 'framework' that influences the social dynamics of that particular nation (Czinkota, 1983; Hofstede, 1993). The call for a 'style' of Management which addresses the milieu of cultures found in South Africa is prevalent amongst the authors on the subject (Booysen, 2001; Inyang, 2008; Karsten & Illa, 2005; Lutz, 2009; Mangaliso, 2001; Mbigi, 1997; Thomas & Bendixen, 2000) (sources). In addition, the discussions surrounding Management in South Africa are infused with a strong ethical agenda, in that they address not only the 'scientific' aspects of Management, but also the ethical questions facing managers in the post-Apartheid era (Horwitz & Browning, 2002; Juggernath, 2013; Lutz, 2009; Mathauer & Imhoff, 2006).

- Feedback and Control

The analysis of the Control Model in Engineering highlighted the significance of *Feedback* being a pivotal aspect of the model. This mechanism is in essence, the part that 'makes the system work'. The

efficiency and effectiveness of the system is directly proportional to the effectiveness and efficiency of the Feedback function of the system (Bolton, 2003; Di Stefeano et al., 1995). In addition, this feature known as Feedback, also introduces a somewhat 'human characteristic' into the system in that it enables the system to 'learn', 'adapt' and correct its previous behaviour (Bolton, 2003; Hofstadter, 2013; Kast & Rosenzweig, 1972; Mindell, 2002; Schwaninger, 2006; Von Bertalanffy, 1972). This notion strengthens the assertion that linkages can indeed be found between the study of human behaviour within a Management context and the Feedback model of Control Theory found in Engineering systems.

## 3.7 Conclusions

The purpose of this chapter was to describe the research methodology of this study, explain the context of the research, describe the procedure used in collecting the data, and provide an overview of the logical process used to analyse the data.

The data has been organised into three groups:

1. Management Theory and the challenges facing Management Theory
2. Management in South Africa and the challenges thereof
3. Feedback Control Theory within Engineering Systems

The following chapter will provide the analysis itself and develop the framework for the argument that will be presented.

# 4 ANALYSIS OF DATA

## 4.1 Unified Theory of Management

### 4.1.1 Introduction

There are some researchers that claim that the way to solve the challenges facing Management Theory is to establish a single, universal and unified theory of Management (Yamamoto, 1965).

The so-called 'confusion' around Management philosophy and the subsequent formation of the different schools of Management thought is far from this ideal and seems to be the 'illness' plaguing what is possibly the most influential field of study of the modern era (Koontz, 1961).

In the 1960's, Harold Koontz presented his recommendations for the makings of the Management Theory revolution. These were the following points (Koontz, 1961):

1. The need for definition of a body of knowledge – defined by the following:

    a. A definition of the field for the purposes of analysis and research

    b. Limiting the scope of the field for the purposes of analysis and research

    c. Distinguishing between tools and content e.g. Mathematics, economics, sociology and psychology are tools of Management, but are not themselves part of the content of the field of Management

This will in turn achieve an integration of Management and other disciplines in that "Management would be regarded as a specific discipline and other disciplines would be looked upon as important bases of the field." (Koontz, 1961)

2. The clarification of semantic terminology

    The glossary of terms required in Management Theory needs to be simplified so that it does not add to the confusion around the definition of Management. The various disciplines need to agree on a universal 'language' of Management.

3. Willingness to distil and test fundamentals

   Each and every field of study begins its life with a statement of fundamental principles, which are then tested and distilled over time until a "purified" blend of laws governing the science is reached. The perspective that Management cannot be measured or quantified is preventing the science from moulding into shape under the "kiln" of experiment and experience.

More recently, similar recommendations have been made. These include the following (Alvesson & Sandberg, 2013; Hofstede, 1978; Miller & Tsang, 2011):

1. Consensus challenging – developing the theory by questioning the assumptions found in existing literature.
2. Spanning research across areas of discipline in search for new insight.
3. Encouraging controversial theories which challenge the framework of study.

The road to unity starts with defining the playing field – the body of Management knowledge. The task is achieved in two distinct ways:

1. Defining what Management *is.*
2. Defining what Management *is not.*

In other words, a consensus needs to be reached on what to include in the scope of Management and which aspects to exclude from the tenet of Management philosophy.

In the following chapters, the first obstacle (defining what Management *is*) will be tackled and an attempt is then made to reveal the aspect of Management that is universally accepted as a key component in any successful system, process or organization.

### 4.1.2 Feedback in Management Theory – Introduction

In order to identify that which is axiomatically accepted within the world of Management Theory, it is important to understand the most basic definition of the term itself – "Management" – as it is conceptually used in the various disciplines or schools.

According to Harold Koontz: "Management is the art of getting things done through and with people in formally organised groups." (Koontz, 1961)

Henri Fayol defines Management as follows: "To manage is to forecast and to plan, to organise, to command, to co-ordinate and to control." (Fayol & Coubrough, 1930)

Peter Drucker writes: "Management is a multi-purpose organ that manages business and manages managers and manages workers and work." (Drucker, 1954)

Whether Management is viewed as an art or a science, the communication between the entity "providing" the Management and the entity "receiving" the Management is of pivotal importance. Without this, the intended result equal to "Management" cannot be achieved. This communication is commonly known as *Feedback*.

### 4.1.3 Feedback in Management Theory – Systems

Chapter 2.4.4 introduced the basic Control Model of a Closed System. It was noted that a system can be defined as being either inherently "Open" or "Closed". It was also noted that the Feedback Loop places a pivotal role in the working of a System. The concept of a System has been analysed for many decades and is the basis for what is known as General Systems Theory or GST. This theory suggests that in fact all of Science can be governed by a single, unified theory. All bodies or elements in the natural world can be viewed as Systems and as such, principles or laws can be established that accurately describe the behaviour of all Systems.

In terms of Feedback within GST, it is clear that this phenomenon has been identified throughout the scientific world and is appropriate to serve as one of the primary truisms of any System. Feedback, as it applies in GST, functions as that mechanism which enables the System to achieve equilibrium or stability. The goal of being "stable" is also known as "steady state" or "homeostasis", the actuality of a System being able to adequately adapt to both external and internal disturbances to the System and achieve the desired output relative to the various inputs to the System (Kast & Rosenzweig, 1972).

In GST, as it applies to Open Systems, stability is achieved through a feedback mechanism. "Homeostasis is based on information exchanges between the system and the external environment, and it allows the system to maintain a state of equilibrium over time." (Mele et al., 2010)

Although the term *feedback* is often used to differentiate between open and closed systems in that feedback is a function of closed systems (Chapter 3.4.4), the basic definition of feedback is in fact the exchange of information with the purpose of the originating party relaying information to the receiving party. The following excerpt clarifies the matter (Ansari, 2004):

“The fifth key tenet is the notion of feedback. Feedback is what allows a system to attain its desired or steady state. There are two types of feedback loops. The first is called negative or error-control feedback in which information on which the system reacts is one that is after the fact or after errors have occurred. The system uses information on small errors to take corrective actions. The other is called feed forward control. It is anticipatory in nature. The system anticipates what might occur and takes corrective action before the disturbances can affect the system. Thermostats use feedback in formation. Keeping a spacecraft on its trajectory requires feed forward control. Trajectory corrections have to take place before the spacecraft gets off its course.”

From a Management Control perspective, the process of control is defined by the “[establishment of an] information and feedback network” (Herath, 2007).

The following diagrams also serve as a means of distinguishing between Open and Closed Systems (Brown, 1966):

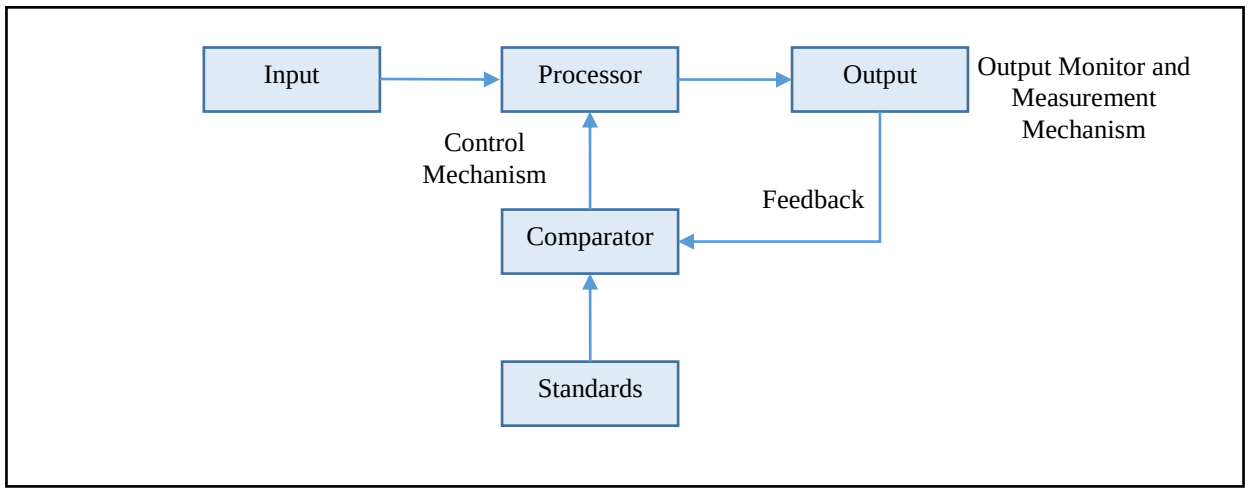



Figure 7: Closed-loop System with Feedback

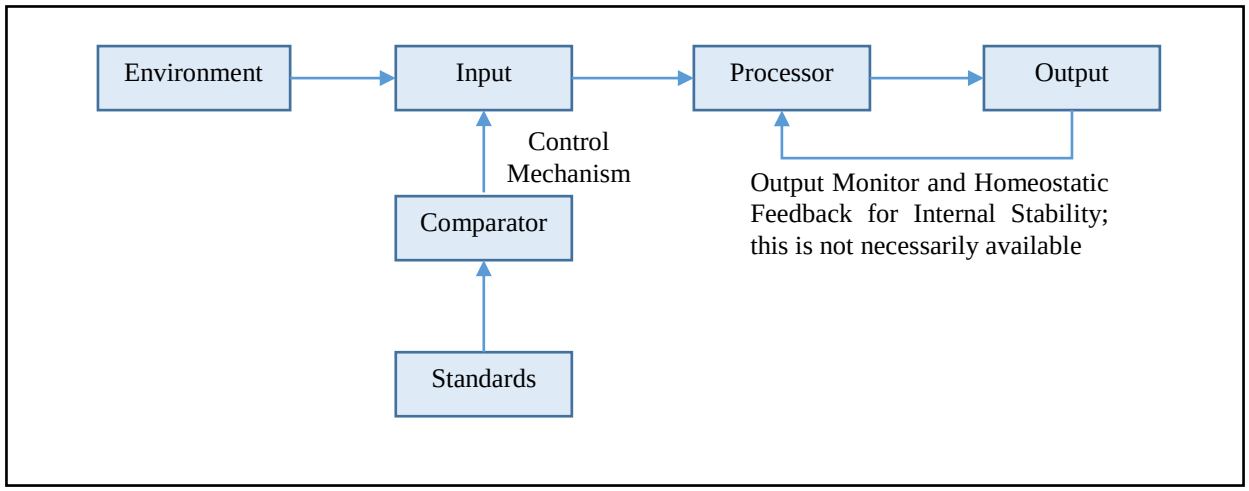



Figure 8: Open System with Feedback

Hofstede defines cybernetics as "a process which uses the negative feedback loop by: setting goals, measuring achievement.., feeding back information…, and correcting the process." (Hofstede, 1978)

"According to the cybernetic hypothesis (Wiener, 1948), the feedback loop is the fundamental building block of action." (Klein, 1989)

Klein (Klein, 1989) expands the feedback principle to include human beings as well: "Although human control systems are more complex. They do operate in the same basic way – utilizing feedback to ensure the attainment of goals." [14]

It is clear that the scientific schools of Management, namely GST, Cybernetics and Control, all rely heavily on the concept of feedback (Brown, 1966; Dahlgaard-Park, 2008; RA Johnson, 1964; Simons, 1991, 1994; Tsui & Ashford, 1994).

### 4.1.4 Feedback in Management Theory – Social Sciences and Psychology

Research in the field of Management psychology (and indeed many of the other disciplines) has identified the need for "self-regulation" or "self-control" on the part of the manager (Tsui & Ashford, 1994). Mathauer discusses the need for effective supervision of health workers, as well as effective provisioning of resources to promote "self-efficacy" and achieve a motivated "can do" attitude within

[14] "Consider, for example, a salesperson who has accepted a quarterly sales quota as a personal goal (the standard). The input function would be information the salesperson perceives about his or her current sales performance. When this information is compared to the standard, the salesperson forms a perception of how well he or she is meeting the quota. If this comparison reveals a discrepancy, the salesperson will take some corrective action, possibly increasing the number of new contracts." (Klein, 1989)

the workforce (Mathauer & Imhoff, 2006). The attempt to strike the balance between supervision and autonomy is an extensively debated topic in Management Theory, however the research suggests a consensus amongst researchers that neither approach – complete supervision (or "micro-Management") versus complete autonomy – can be adopted exclusively (Draganidis & Mentzas, 2006; Gist, 1987; Kim, 1984; Mathauer & Imhoff, 2006; Sparr & Sonnentag, 2008). In other words, there is an agreement within the academic community that the role of Management is two-fold:

- Effectively supervise and manage the workforce in terms of the required goals.
- Instil a sense of "self-control" within the individual employees that motivates the employee to achieve these goals.

Managers who are successful in self-regulation techniques of Management can "respond to the complexity and dynamic pace of their immediate environment in a timely fashion" (Tsui & Ashford, 1994).

Self-regulation is defined as the method of "how to help people to help themselves" (Tsui & Ashford, 1994). A model of self-regulation, based on the feedback-control model, has been investigated and adopted by many researchers under the label "behavioural self-Management" (Simons, 1991, 1994; Tsui & Ashford, 1994). See Figure 9 below.

The model can be described as follows (Tsui & Ashford, 1994):

1. Set a goal
2. Self-monitor behaviour in light of that goal
3. Self-evaluate
4. Self-consequate (reward or punish)

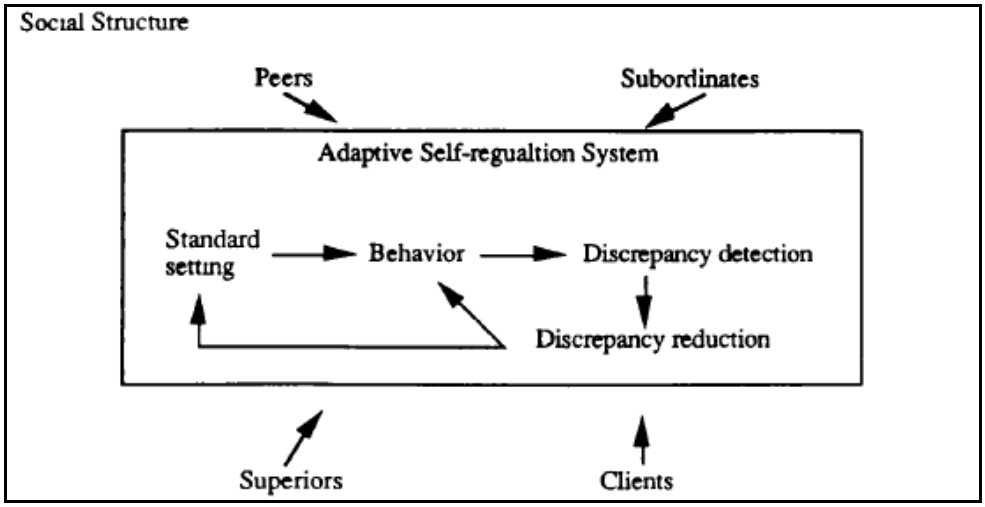



Figure 9: An Adaptive Self-regulation Model (Tsui & Ashford, 1994)

The role of feedback (specifically) in this model is clearly identifiable. In order to determine discrepancies between the manager's behaviour and that of the student they have adopted, feedback is required.

In addition, feedback is required (on a regular basis) between managers and individuals. This is usually achieved through performance reviews, peer reviews, informal conversations and others. The importance of this type of feedback has been identified and emphasized by many researchers. In fact, current research suggests that there is not enough feedback taking place within organizations today and that managers must actively seek such feedback information wherever possible (Tsui & Ashford, 1994).

## 4.2 Ubuntu and Management in South Africa

### 4.2.1 What is "Ubuntu"?

*Ubuntu* is an Nguni Bantu term, literally "human-ness", which has come to be used as a term for a humanistic philosophy which first appeared in South African sources in the mid-19th century.

"Ubuntu can be defined as humaneness – pervasive spirit of caring and community, harmony and hospitality, respect and responsiveness – that individuals and groups display for one another" (Mangaliso, 2001). It is a unifying world view encapsulated in the maxim "*Umuntu ngumuntu ngabantu*": "a person is a person through other person." An individual is defined by his or her relationships with others. (Littrell, 2011)

Whilst the framework of Ubuntu philosophy is not clearly defined, there are however certain fundamental core values or principles (Mbigi, 1997):

1. Respect for the dignity of others
2. Group solidarity
3. Teamwork
4. Service to others
5. Spirit of harmony and interdependence (each one of us needs all of us)

In essence, Ubuntu embodies a strong sense of collectivism and community orientation towards a shared or common goal.

### 4.2.2 Ubuntu in Management

Applying the Ubuntu philosophy to Management Theory has been identified as the potential 'cure' for many of the challenges facing Management in developing economies, such as South Africa (Booysen, 2001, 2007; Bush, 2007; Horwitz & Browning, 2002; Human, 1996).

The premise for this hypothesis is that there are significant cultural differences between Western and non-Western nations (Berry et al., 2009; Czinkota, 1983; Gerstner & Day, 1994; Hofstede, 1993; McFarlin et al., 1999). Whilst there are many subtle nuances that define these cultural differences, the primary distinction is that Western cultures adopt a view that the focus of Management must be on the individual and the individual's performance, whereas non-Western societies adopt a broader, communal perspective. Jackson applies the definition of *Instrumentalism* and *Humanism* to this distinction. The differences in Management practices are described below in Table 3 (Jackson, 1999):

| | **Management Practices** | **Management Attitudes** | **Organizational Orientation** | **Developing People** |
|---|---|---|---|---|
| **Instrumentalism** | Human resource Management | People are a valuable resource | People serve the ends of the organization | Competencies approach – equipping people for the job |
| **Humanism** | People development | People have a value within themselves | The organization serves the ends of its people | Holism – developing the whole person |

Table 3: Instrumentalism vs. Humanism

In summary, the difference between Eurocentric (Western) Management and Afrocentric (Ubuntu) Management relates to the place of the individual (the self) and his or her responsibilities towards the organization (the community) versus the organization and its responsibilities towards the people within it.

### 4.2.3 Ubuntu and Management in South Africa

The challenges facing Management in South Africa has been described in Chapter 2.3. These are summarised below in Table 4:

| **Challenge facing Management in South Africa** | **Detail** |
|---|---|
| Managers are aloof | Class-distinction between managers and staff |
| Open communication | Not enough face-to-face interactions |
| Social attitudes leading to conflict | Social misunderstandings leading to conflict |
| Individualism vs. Collectivism | Lack of collective loyalty towards the organization |
| Investment in People | Shortage of in-house training |
| BEE and skills shortage | Lack of education and mistrust in the BEE system |
| Performance measurement | Result-based judgements leading to conflict |

Table 4: Summary of Management challenges in South Africa

Scholars have offered various suggestions and recommendations to resolve these issues. These are reproduced from Chapter 2.3.9 in Table 5:

| **Suggestion or Recommendation** | **Detail** |
|---|---|
| Adopting a more "Afrocentric" view of Management | Embracing the cultural values of the African society and applying the appropriate Management approach based on these values. |
| Valuing Diversity | Emphasising and celebrating the differences within the societal groups as a tool that will improve performance as well as the general quality of life for the employees. |
| Creating a holistic corporate identity and vision | Applying a broad strategy that aims to infuse cultural values into every aspect of the organization. |

| | |
|---|---|
| Instilling trust and shared values | Promoting a common and shared vision for the organization, where each and every employee places an integral part. |
| Measuring and rewarding collective performance | Adopting a "team" structure that rewards overall performance based on collective effort. |
| Skills development and encouraging personal development | Emphasis on personal growth within the organization and instilling as sense of pride and hope within the workforce. |
| Establishing an effective platform for communication | Encouraging employee feedback and establishing a culture of open communication or dialogue between manager and employee. |

Table 5: Suggestions to Resolve Management Challenges

It is important to note that when researchers have addressed the adoption of the Afrocentric or Ubuntu approach to Management, many have emphasized that this type of philosophy should not be adopted exclusively i.e. at the expense of the Western or Eurocentric principles. In other words, a synergy between the two models must be achieved where Eurocentric models of Management are built on a cultural basis. For example, performance measurement must still be integrated fully into the organization, however, the measurement tools being used must adapted to fit the cultural context in which they are being applied (Booysen, 2001; T. Jackson, 1999; Karsten & Illa, 2005; Mathauer & Imhoff, 2006; Mbigi, 1997).

In addition, the issues mentioned above can also be reduced to the following two basic categories[15]:

1. **Communication** – understanding one another
2. **Self-identification** - seeing one other as an equal and integral part of a collective whole

In other words, an organization in which members can effectively communicate with one another, and where each individual personally identifies with the collective vision and values of the organization, will be able to overcome the Management challenges mentioned above.

Each and every individual, in each level of authority, must hold him- or herself accountable and responsible for the overall success of the organization's goals and aspirations, as well as see him-or

[15] The subject of BEE, or Affirmative Action, and the challenges implementing such a system are not discussed here. This topic is seen as an exception to the other issues which are interrelated.

herself as being accountable to the other members of the organization (Mathauer & Imhoff, 2006; Poovan, 2006).

In essence, a unified organization is a conflict-free organization, no matter which ethnic or racial groups are found within.

However, in spite of these conclusions, there are many questions facing the practicalities of how to achieve this sense of unity and collectivism. Many scholars have described what needs to implemented in terms of this cultural "paradigm shift" however, the actual models themselves are still in need of development (Karsten & Illa, 2005; Lutz, 2009; McFarlin et al., 1999).

Some of the specific questions confronting the Afrocentric Model of Management are:

- How does an organization practically achieve a sense of communalism?
- How does an organization maintain a structure of hierarchy whilst still achieving a sense of collectivism?
- What is the model of performance measurement in the Ubuntu system?

The following chapter will digress slightly in order to analyse the characteristics of the Feedback Control Model as it appears in Engineering Control. This analysis will be used as the basis for the proposed approach to offer a practical model for implementing the Afrocentric model of Management.

## 4.3 Feedback as the Ideal Communicator

### 4.3.1 The Simple Feedback Loop Revisited

Chapter 2.4 provided a brief review of the Control Model as it is found in Engineering Mathematics or Control Systems. Firstly, the most basic graphical model of a control system is reproduced in Figure 10:

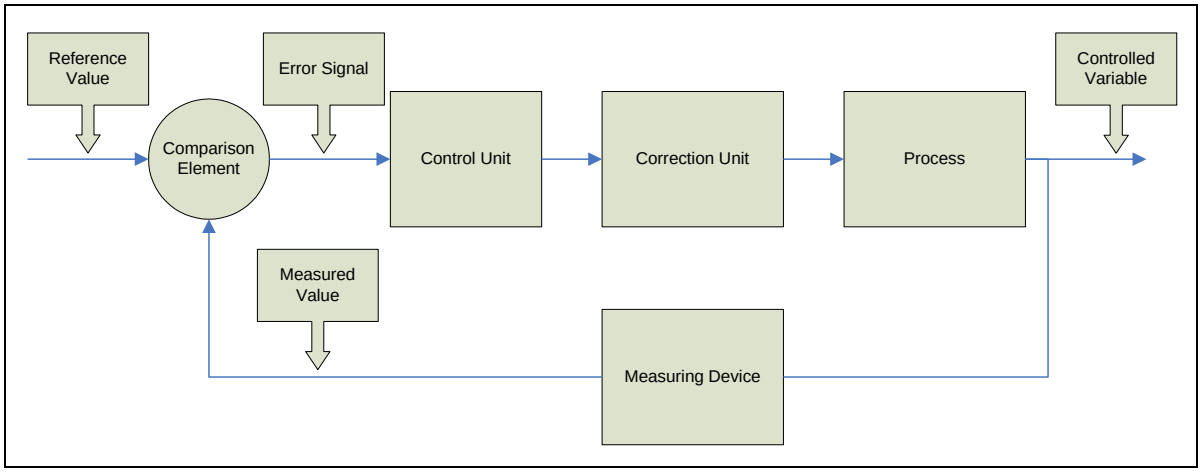



Figure 10: Simple Control System

The elements of the system have already been discussed above; however an alternative perspective is offered here. This perspective relies on a more conceptual understanding of the model and analyses the elements of the model based on their individual responsibilities or 'purpose'.

1. Comparison element

   This element is responsible to compare the value of the system's current output with the reference value of what the system is supposed to achieve. The discrepancy between the system's output and the reference value is then reported as an "error signal", or in other words, the amount by which the system is not achieving its goal.

2. Control Element

   This element is responsible in deciding what action is to be taken when it receives an error signal. The Control Element must assess the current situation and apply logic in determining what corrective action needs to be taken. This action can also be described as a "Management decision".

3. Correction Element

   The correction element is responsible for applying the corrective action and produce a change in the process to correct the system's output to the desired reference value or goal.

4. Process Element

   The process element is what is being controlled or managed. This effectively is comprised of the resources required to achieve the desired output as well as the process designed at achieving this goal.

5. Measurement Element

   This element is responsible for measuring the system's output and provide this feedback to the comparison element in a format or language that can be understood by the comparison element.

In order to translate these terms into non-Engineering terms, the following analogy is used:

A factory or plant that produces or manufactures a product can be depicted as a Feedback System. This system is comprised of the raw materials required to manufacture the product, the staff and resources used in the manufacturing process and the final product being produced. In addition, the Management of the factory and the Human Resources aspects of the organization are involved in managing the staff and other resources in achieving efficiency and profitability for the organization.

Figure 11 shows this organization as a common Control System with its various elements. Most, if not all organizations can be reduced in a similar way into a form of Control System.

The Comparison Element would be the equivalent of the Managements reports or financial results. These reports compare the results of the factory's output relative to the desired results it aims to achieve.

The Control Element has the role of controlling or managing the system. The Management body therefore, is equivalent to the Control Element.

The Correction Element is the supervisors or team leaders who are responsible for implementing Management decisions and any corrective action that needs to be taken within the factory's operations.

The Process Element is the staff, resources and operational procedures within the factory.

The Reference Value will be the current output of the factory i.e. it's current performance.

The Error Signal will be the shortfall between the desired output and the current output i.e. by how much the factory is under-performing.

The Control Variable will be the future output or 'new' output of the factory after the relevant control or Management decisions have been implemented.

Finally, the Measurement Element is responsible for measuring the factory's output or performance. Performance feedback tools that gather data about the performance of the staff and the other aspects of the factory e.g. the machinery, as well as the human resources team are responsible for this task.

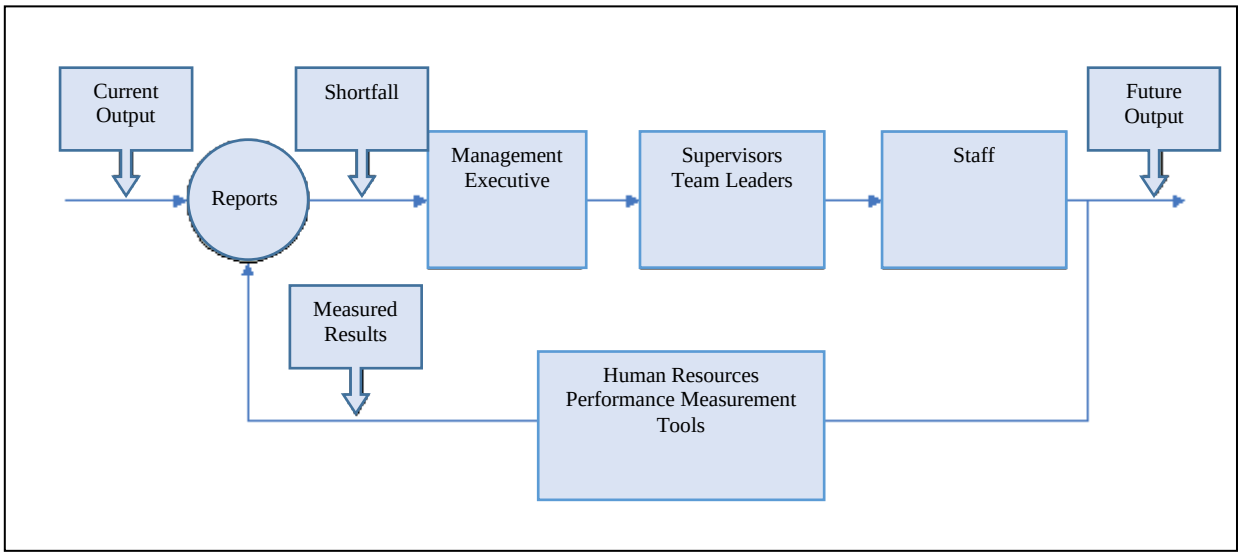



Figure 11: Simple Factory as a Control System

### 4.3.2 Feedback as the Ideal Communicator

The conclusion of Chapter 4.1 was that Management Theory is in need of a form of "unification" in the form of a single, unified theory of Management. The starting point in the development of such a theory has been identified as:

- The development of a unified glossary of semantics (terminology)
- Identifying and focusing on the areas of the theory where there is general consensus and agreement

In Chapter 4.2, the path to achieving a successful model of Afrocentric Management was identified. The two primary contributing factors were identified and categorized as follows:

1. **Communication**: The effectiveness of the dialogue between authority groups as well as ethnic and racial groups.
2. **Self-Identity**: The extent to which the individual identifies with the common values and goals of the organization.

In light of these deductions, the argument is presented that the Feedback Control Model offers a significant contribution to achieving both of these ideals. The author is of the opinion that the Feedback Model offers a universal platform of understanding which in turn is able to effectively communicate the principles of "real" Management across all borders, whether professional, cultural or otherwise.

This assertion is founded on the facts that the Feedback Control Model is an already founded basis for the subject of Management Theory and historically speaking, forms the basis for the evolution of the subject.

- **Feedback is measurable**

As discussed previously, Management theory recognises the ability to measure performance as being critical to Management processes. The Feedback or Control Model is an already established model within the Engineering world and has been refined and researched considerably for over a century.

The model has well-developed performance measures which can be tested and measured experimentally. This is an attractive attribute for Management theory in general as it removes many of the obstacles for defining a scope or framework for research and is already primed for practical and measurable experimentation (Miller & Tsang, 2011).

- **Feedback is universally accepted**

The concept of Feedback is accepted by all academic disciplines (Chapter 4.1.2) as a fundamental principle of Management. Although the semantics surrounding feedback may vary slightly, most of the "work" in defining a single glossary of feedback terminology has already been achieved.

- **Graphical representation**

The fact that the concept of feedback can be conveyed graphically has many benefits:

A. No bias or socio-political agenda

A diagram is "politically-neutral" and does not embody any particular social or cultural stance.

B. Establishes a forum for open communication

The mechanism of feedback is directly aimed at achieving open communication and is open to all levels of an organization, facilitating input by all employees into the organization's vision.

C. Encourages initiative

The fact that feedback processes are "non-judgemental" encourages initiative-taking and proactive involvement throughout the organization. This in turn, achieves higher levels of motivation, which is directly proportional to improved performance.

D. Accommodates for language or cultural discrepancies

Due to its graphic nature the feedback model accommodates for any language or cultural background and achieves a single, objective view of the organization. This method also circumvents any literacy challenges that may exist on account of a lack of formal education.

E. Promotes growth and skills development

One of the main hindrances for individual growth is the feeling that the individual cannot achieve a higher skill level. In other words, the individual presumes that due to his or her limited education, he or she will never be able to understand the concepts or tasks that higher-level employees are doing.

By making a process or task easier to understand through graphical depictions, staff are encouraged to strive for higher positions and promotes higher levels of self-esteem and individual productivity. This in turn also makes the individual more receptive to skills development initiatives and programmes.

F. Conveys a sense of collectivism

The graphical depiction of the organization (organogram) as well as general tasks and responsibilities provides the staff with an understanding of exactly where they fit into the operational structure and the organization as a whole. The strategy and goals of the organization can also be displayed with this method (e.g. company/department targets and goals). This creates a higher sense of communalism and portrays the executive Management body as being equally part of this community and not as a detached autocracy.

The resulting atmosphere within the organization will promote a stronger sense of unity and collective vision and responsibility throughout the organization.

In summary, the Feedback Model and in particular the graphical representation of the model with its mathematical performance measures, is poised for a unique role in the unification of Management theory, its place in the practical environment, its role in resolving many of the conflicts in South African organizations and promoting significant growth and organizational revolution in South Africa and other developing countries.

## 4.4 Reduction of Management Scenarios and Feedback Loops

### 4.4.1 Introduction

The following Chapter aims at providing practical examples of how the Feedback Model can be applied to common Management scenarios.

It is important to note that the following examples are simplified and serve only as an introductory step into the more detailed integration of the Feedback Model into an organization. Chapter 5.5.2 will provide a detailed overview of the implications for practice.

### 4.4.2 Company Structure Diagram

Commonly referred to as an "organogram", the purpose of this diagram is to display the overall structure of the organization with its various departments and teams.

In addition, this diagram usually serves to define the individual roles and responsibilities of each team or group as well as each individual member (commonly referred to as a "job description"). Figure 12 is a common example of such a diagram:

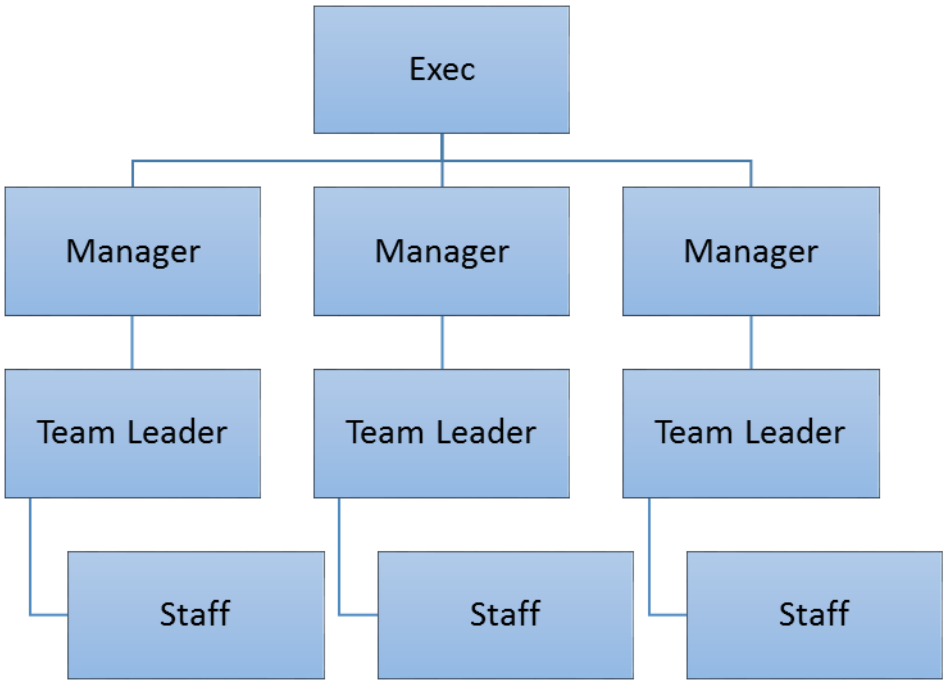



Figure 12: Common example of an Organogram

What is noticeable about this structure is that it portrays a classic hierarchal system, with the executives occupying the higher levels and each employee being below them. This portrayal reinforces the misconception that a superior is on some sort of higher level of class and is 'better' than the person beneath them in the hierarchy.

In the Feedback Model, there is no such hierarchy. A comparative element is in no way superior to a measuring element or a process element. This is in spite of the fact that a comparative element may indeed be a more sophisticated or 'skilled' piece of technology. For example, a microprocessor is far more complex than a simple relay or switch. However, both these elements occupy the same hierarchal neutrality within the Feedback Model.

The "feedback version" of a simple organogram could perhaps look more like the following:

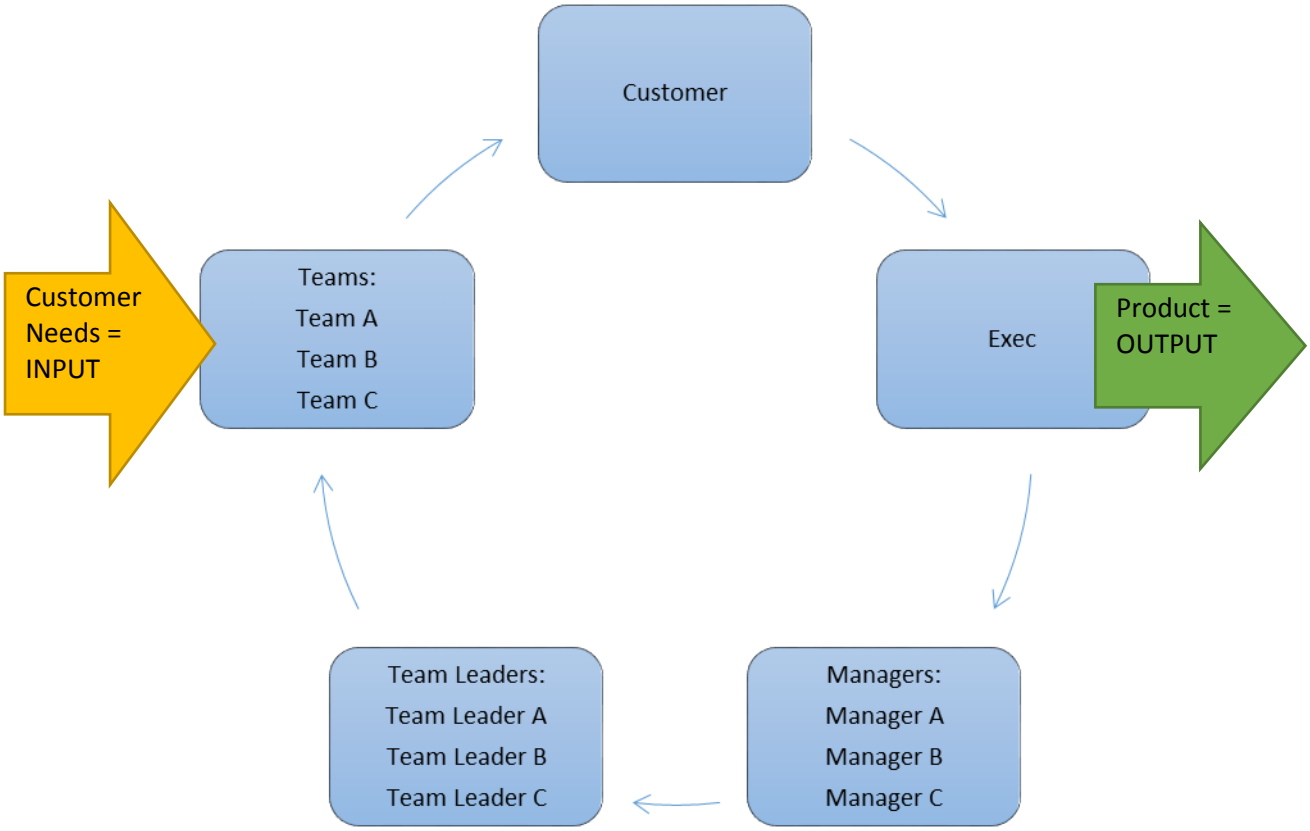



Figure 13: Feedback version of an Organogram

The result of displaying the company structure is still achieved but what it also achieves is a sense of collective responsibility and individual importance to the achievement of the organizational goals.

### 4.4.3 Company Vision Diagram

It is very common for an organization or company to display its vision in written form (poster, website, letterhead etc.). The purpose of this statement is to direct the company towards a shared vision and provide the reader with a sense of what the company values are, as well as what it aims to achieve.

**Our Vision**

Our vision serves as the framework for our Roadmap and guides every aspect of our business by describing what we need to accomplish in order to continue achieving sustainable, quality growth.

**People:** Be a great place to work where people are inspired to be the best they can be.

**Portfolio:** Bring to the world a portfolio of quality beverage brands that anticipate and satisfy people's desires and needs.

**Partners:** Nurture a winning network of customers and suppliers, together we create mutual, enduring value.

**Planet:** Be a responsible citizen that makes a difference by helping build and support sustainable communities.

**Profit:** Maximize long-term return to shareowners while being mindful of our overall responsibilities.

**Productivity:** Be a highly effective, lean and fast-moving organization.

Figure 14: Company Vision Statement

(Source: http://www.coca-colacompany.com/our-company/mission-vision-values)

Seemingly there is nothing wrong with this type of statement. However, when considering the literacy level of a lower paid employee e.g. tea lady or janitor, or the fact that English is for the vast majority of South Africans, at least a second language, the flaw in the statement becomes clear: Some or many of the employees simply do not understand what these words mean, let alone identify with their message and feel responsible for its fulfilment. Similarly, a Feedback Version of the same company vision statement would be as follows:




Figure 15: Feedback version of Company Vision Statement

Again, this still conveys the same message but also makes each and every employee able to identify themselves within this picture and able to relate to its message.

### 4.4.4 Feedback Procedures or Structure Diagram

Human Resources Management recognises the place of feedback between manager and employee and emphasises the need to set the right atmosphere that will make the feedback encounter or "session" as constructive as possible (Tsui & Ashford, 1994).

The factors which makes a forum such as this conducive for constructive feedback can be summarized as follows (*Giving Feedback*, 2006):

- **Know when to step in**

Referring back to the initial discussion on the fundamentals of control (Chapter 4.3.1), the argument was made that the junction where the feedback loop ends is vitally important in ensuring the integrity of the information. One can infer from this that the timing of when the information is received is of equal importance. The information must be received exactly at the time when is most appropriate.

- **When feedback works and when it doesn't**

"Feedback is more likely to affect learning, growth, and change in areas that least threaten the recipient's sense of self-worth" (*Giving Feedback*, 2006). This indicates that the information passed by the feedback loop must be productive. Unless this information will contribute to improving the performance of that specific element receiving the feedback, feedback could be detrimental to the process.

- **Future-focused feedback**

A new term is introduced here. The idea of feedback being focused on future developments can be extremely beneficial. In the strict sense, a basic feedback loop only reports on the past events. To have feedback that bears in mind where the system needs to go, is a powerful tool. Goal-orientated feedback has been introduced earlier on a basic level. The consideration made here is that feedback can be 'pre-programmed' with the overall goals for the system, allowing it to adapt its operation accordingly.

- **Receptive work environments**

The system environment is pivotal to the effective operation of its processes. The environment must be suitable to the process which will operate within it. This has significance for system design.

- **Never schedule a feedback session for a Friday afternoon**

Again, the timing of when the feedback is given or received is extremely important. The concept of a "Friday afternoon" is the time when the potential for proper transfer is at a minimum. A deep understanding of the characteristics and behaviour of each element in the control system is necessary in order to ensure the feedback is transferred at the correct time.

In light of these guidelines, the Feedback Procedure Diagram (Figure 15) is presented. This diagram aims at providing the employee with a clear view of how his or her feedback will be used and what the purpose is for the feedback session.

"More open interactions will help resolve another complaint often lodged by black employees – that they are not part of the decision-making 'loop'." (McFarlin et al., 1999)

The diagram also removes any hesitation on the part of the employee in speaking openly with the HR representative by setting clear feedback lines and removing any judgement or fear of criticism by reinforcing the message that the manager, and company as a whole, is actively seeking this feedback in order to improve the quality of life if its employees and make the work environment better for everyone. In the case of the individual's own performance, the feedback session is seen as being aimed at helping the individual achieve success and not to "catch him or her out" for disciplinary action. An example of such a diagram could be as follows:

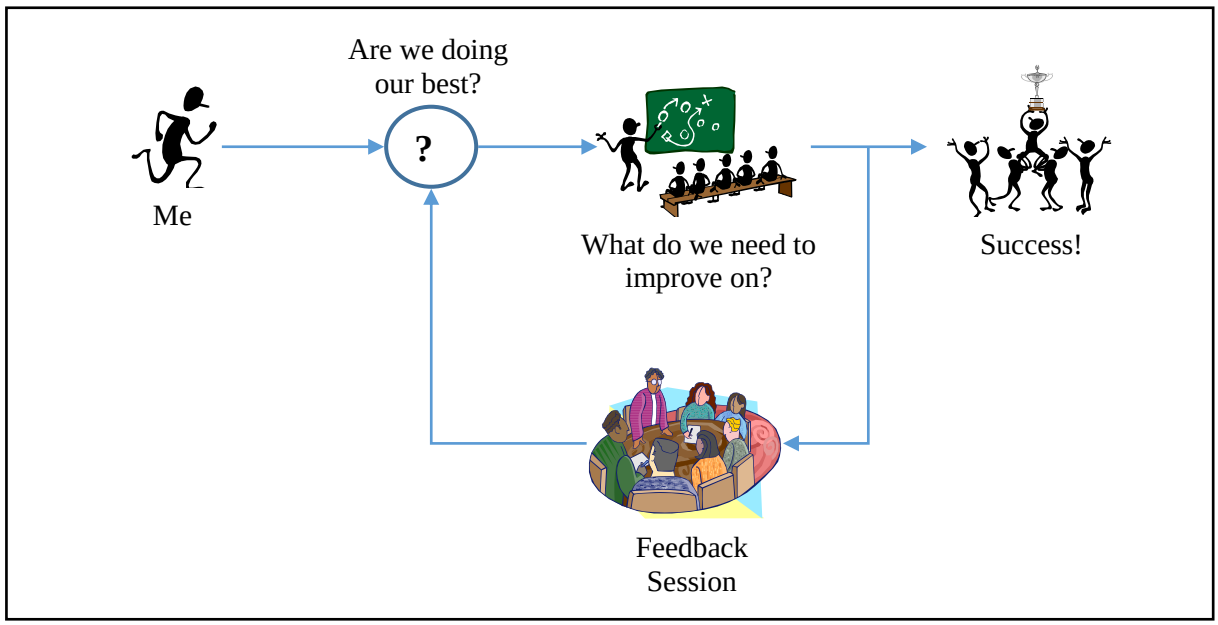



Figure 16: Example of a Feedback Procedure Diagram

The conclusions that can be drawn from the discussions above are the following:

- Human Resources Management recognises the Feedback loop as a fundamental of effective feedback
- The factors or variables influencing successful Feedback in Control are the same as in Human Resource Management

- Being transparent and explicit about feedback in the HR process (i.e. transparent about how the feedback will be used) will have a positive impact on the relationship between manager and employee

These concluding points also have special significance for the South African's environment. The HR processes can contribute towards building a trusting relationship between Management and the other employees, as well as establishing an open forum for communication within the organization. The benefits of these accomplishments have been previously highlighted in Chapter 4.2.3.

### 4.4.5 Performance Measurement

A tremendous amount of research has gone into, and is continuously going into, seeking ways to accurately measure employee performance in order to optimize productivity.

The role of the manager in this case, is to achieve the highest employee efficiency as possible. If an organization can accurately measure employee performance, the Management can then make the necessary adjustments to the operations procedures, measure again, until the desired optimization figures are reached.

In Engineering Control, performance is measured on system response and the system's ability to obtain equilibrium. In this context, the variables are clear, formulae have been developed and there is somewhat of an objectivity to the science of performance measurement in Engineering. Where debate exists, it is usually on how to make the formula even more accurate. This is however due to the fact that effective Engineering depends on very small measurements that have significant ramifications in practice. For example, the difference between a formula being accurate to a fraction of a millimetre can make the difference between a bridge being able to stand or not.

In performance Management however, the measure is based on the individual's ability to perform the task(s) allocated to his or her job description. This poses a serious challenge as the assessment of whether the employee did what he or she needed to do is subjective to the manager's or assessor's perspective and opinion.

Responding to this discrepancy between Engineering Performance Measurement and Employee Performance Management, the following analysis is presented:

- **Definition of Gain**

Gain is a variable in Systems Engineering or Control that is defined as the ratio between the output and the input of a process or system (Årström, 1991; Middlebrook, 1975):

$$Gain = \frac{[O]}{[I]} = \frac{Output}{Input}$$

An important aspect of Gain is the point at where Gain is measured. The point at which to measure the Gain of a system is that point at which the *Impendence* is arbitrary (Middlebrook, 1975).

*Impedance* is defined by the Oxford Dictionary as:

"The effective resistance of an electric circuit or component to alternating current, arising from the combined effects of ohmic resistance and reactance. Impedance is usually expressed as a complex quantity $Z = R + jX$, where $R$ is resistance, $X$ is reactance, and $j$ is the imaginary square root of −1." (Source: http://www.oxforddictionaries.com/definition/english/impedance)

In Lay terms, this means that Gain needs to be measured at a point where the measurement will not be skewed by other internal factors. In other words, the measure of the net performance of the system as a whole.

Gain is therefore a measure of 'how close' the system is to reaching equilibrium or in 'human' terms, how close the employee is to being able to complete the task properly (according to the benchmark that has been set for the task).

This perspective places emphasis not on what the employee is *not* doing but rather on how close the employee is to achieving the desired performance based on his or her personal abilities and expectations. In other words, this is not a fixed measure of performance, where the result is either Yes or No, but rather presents a spectrum (or graph) of performance and a simple measurement that the employees themselves can fully grasp and understand.

This in turn, promotes a positive outlook on constructive criticism or feedback as the employees can understand what is being expected of them and how close they are to achieving these goals.

In addition, this approach also assists companies in establishing a single benchmark for performance where the employees are not competing against one another, but against themselves and their own performance. This makes the employee feel that the company treats its employees fairly and that he or she is not expected to do a task that is beyond his or her competency or skill levels. He or she is also not expected to compete against other employees who may have a better education or privileged upbringing.

- **Measuring Gain over Time**

In order to adopt this approach to Performance Management, a measure of performance over a period of time is required in order to establish the pattern of performance.

In Engineering terms, if $Gain\ (G) = \frac{[O]}{[I]}$, then the same measure over time is expressed as:

$G(s) = \frac{[O(s)]}{[I(s)]}$, where *O(s)* is the *Laplace Transform* of the Output measurement (see Appendix G for a more detailed description of the Laplace Transform).

The ratio of *O(s)* versus *I(s)* is known as the *Transfer Function* of the system.

Transfer Functions are very complex mathematical concepts and the definition provided here has been simplified considerably. It does however convey the conceptual basics of what a Transfer Function measures.

A Transfer Function is defined here as the measure of how a system performs over time, or the "formula" for measuring how a system performs over time. This measures how close the system is to achieving its allotted goals or tasks (or equilibrium) over a defined period of time.

This measure becomes an extremely powerful tool if we are able to translate this to human behaviour and we can essentially 'predict' an employee's future performance based on the current trajectory and past performances. In addition, the simple conceptual understanding of what Transfer Functions are, highlights another important principle for Performance Management, namely the need for trend monitoring and assessing performance based on a time-based scale and not on a quantity-based scale i.e. we don't simply add all of the Performance Evaluations as a sum of numbers, but rather look at a behavioural patterns of performance. This provided much greater insight into the employee's nature and how they respond to the expectations made of them.

Another aspect of tracking the measure of Gain over time is that it also highlights the variance between Output and Input over time. Simply put, this shows how consistent the employee has been over time and obtain insight into the 'endurance' of the employee. For example, an employee may be achieving a high performance average, but because he or she scores high some of the time, and low some of the time, the average score can be misleading in assessing the employee's contribution to the process or task.

By tracking variance it is clear that the employee is not achieving his or her full potential and if better managed, be able to achieve consistently high scores. Another possible outcome of this analysis is that this particular employee is suited for some tasks, but not others – a sign of a 'specialist', or that the employee simply is not consistent and has a lack of endurance.

In any event, the manager is now able to correctly apply the necessary Management attention to the employee and obtain clarity on how best to handle the employee, rather than simply overlooking the employee's performance due to an acceptable average score. For example, suppose an employee called Jane is given 5 tasks, ranging in difficulty between a score of 10 and 50 (a benchmark set by the manager) and achieves the following scores over a period of 6 months:

| | | **Score** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Task** | Required Score | Jan | Feb | Mar | Apr | May | Jun | Ave. | % |
| Sort incoming faxes into IN tray | 10 | 8 | 8 | 7 | 6 | 8 | 6 | 7.2 | 71.7 |
| Categorise faxes by recipient | 15 | 12 | 14 | 14 | 14 | 13 | 14 | 13.5 | 90.0 |
| Mark appropriate faxes as URGENT | 25 | 18 | 20 | 15 | 18 | 15 | 15 | 16.8 | 67.3 |
| Check that URGENT faxes have been received with the appropriate detail and clarity | 40 | 30 | 25 | 25 | 25 | 30 | 35 | 28.3 | 70.8 |
| Email each manager notifying them if they have faxes waiting | 15 | 15 | 14 | 15 | 12 | 15 | 15 | 14.3 | 95.6 |
| Overall Average Score | 16.03 | | | | | | | | |
| Overall Average Percentage | 79.08 | | | | | | | | |

Table 6: Jane's results over a 6 month period

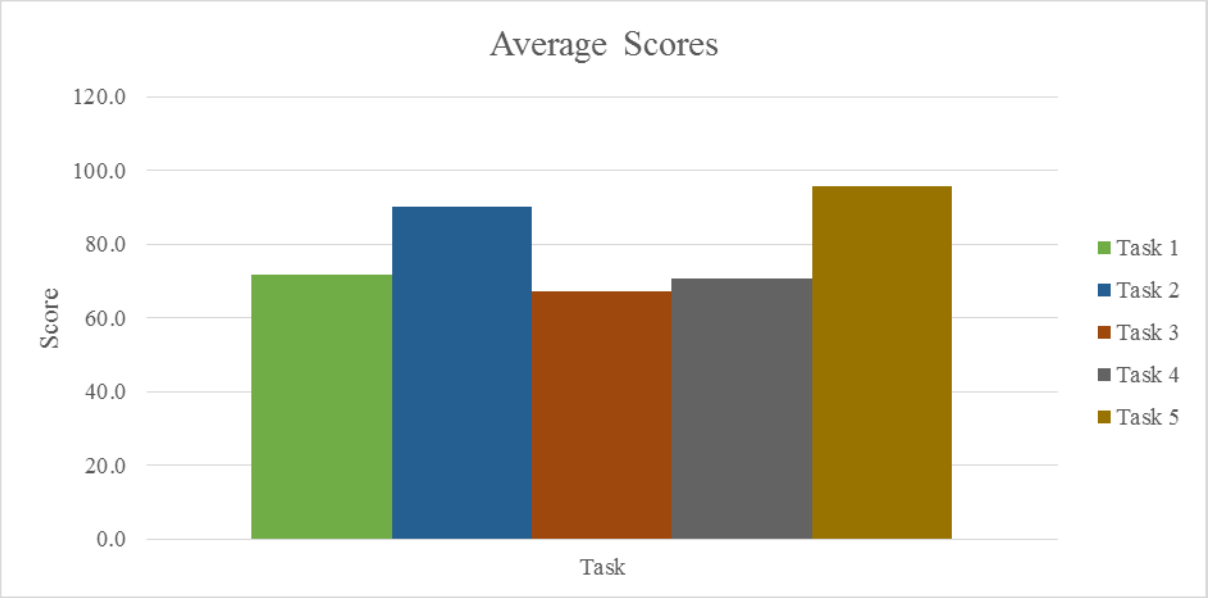



Figure 17: Jane's results over a 6 month period

This type of scorecard is typical in Performance Management. A first-glance will immediately reveal the shortcomings of this perspective on the measuring of task performance and how to draw conclusions about Jane's behaviour.

Firstly, the result for Overall Average Score is meaningless. Each task is scored differently and therefore an average score does not reflect at all on whether Jane is performing or not.

Secondly, the result for Overall Average Percentage does highlight whether the employee is performing on the whole. However, it does not provide any insight into the details of Jane's behaviour, namely:

a. In which tasks Jane is not performing to her potential and what the company expects of her.
b. Is Jane's performance consistent over time or does she have 'good' months and 'bad' months?
c. Is Jane more suited for a specific set of tasks or perhaps is exceptional at one particular task or area of expertise?
d. Is Jane not competent enough in certain tasks and is perhaps in need of training or some other type of guidance?

The next figure will show the same results but with Gain being the measure used and in graphical form:

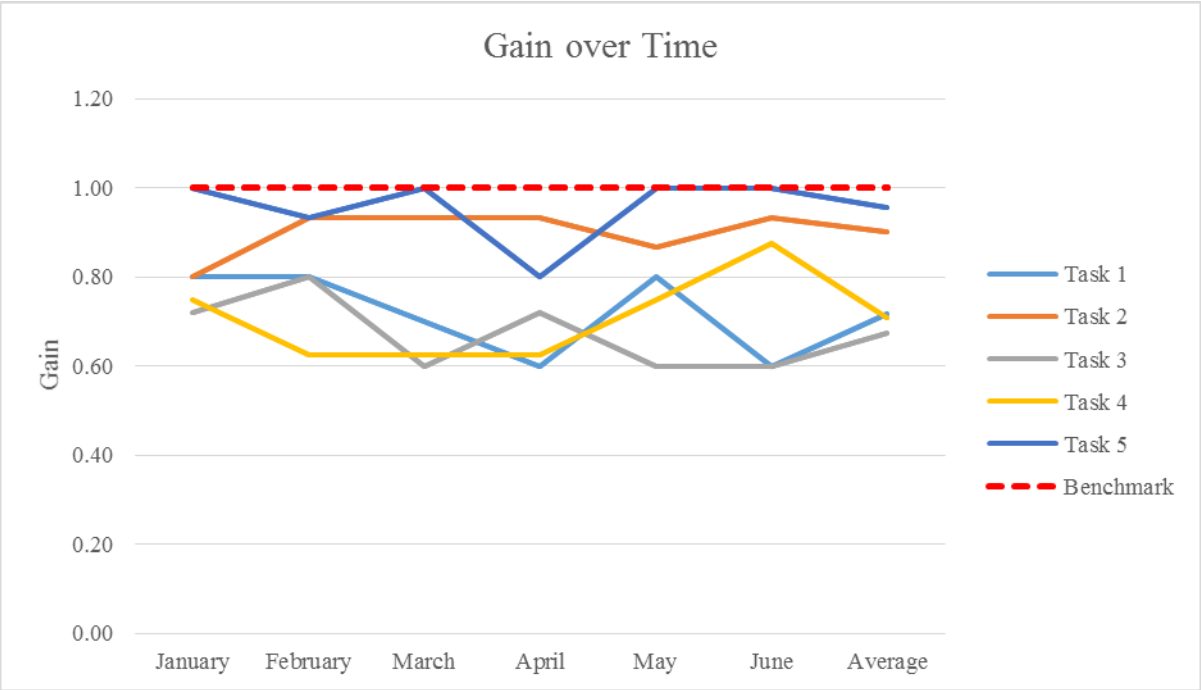



Figure 18: Jane's performance represented using Gain

The above graph provides a completely different picture of Jane's behaviour. Firstly, each task and its associated performance is both separate enough to view individually, as well as being able to see a 'holistic' view of Jane's overall performance.

Jane seems to be performing well in Tasks 5 and 2, being consistently close to equilibrium (Gain = 1.00), but less so on the other tasks. Her consistency with the other tasks also seems to be lacking in Tasks 4 and 5, with some months scoring well but others well-below the previous scores.

As far as the degree of difficulty of the task, Jane is certainly capable of achieving acceptable performance but is not able to do so consistently. Task 4, being the most difficult, shows general under-performance, however there is a spike in the curve for June that shows that she is clearly competent enough to do the task well. This indicates a need for further training or advisement on the more difficult tasks. Furthermore, some of the easier task e.g. Task 1 is certainly within her capabilities but she is not achieving her potential. This could indicate an issue in self-Management or how Jane manages her time, which tasks she does when, and whether she is trying to do more than one task at the same time.

The following graph will show the same data but from the perspective of Variance:

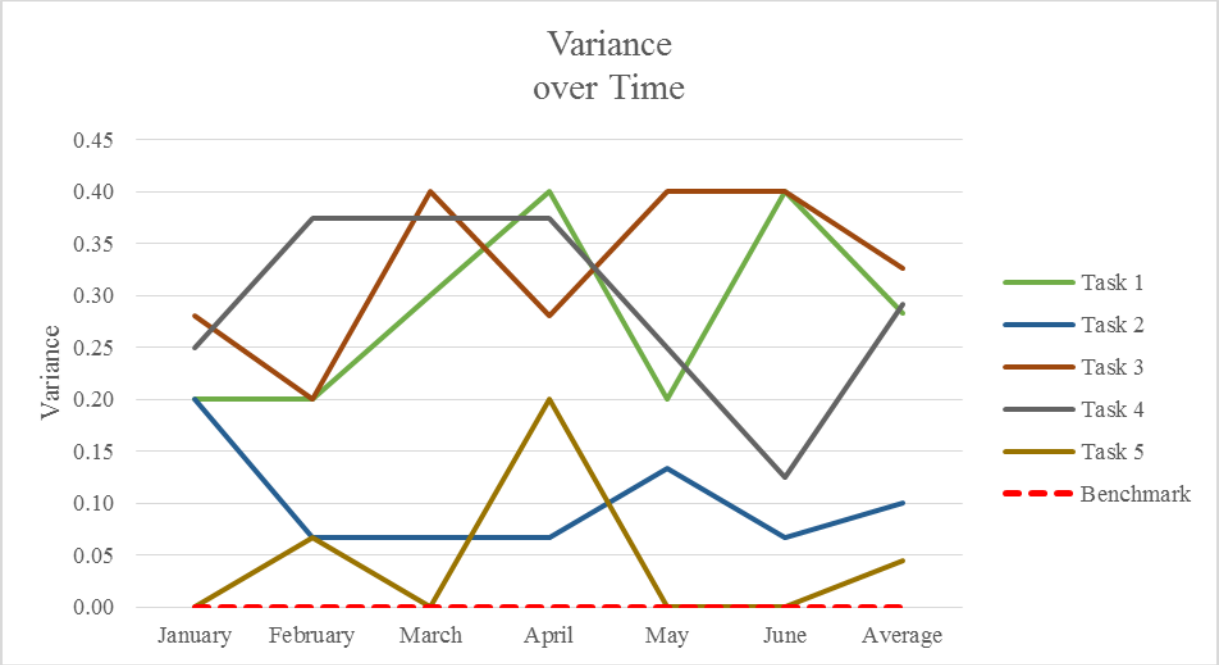



Figure 19: Jane's performance represented using Variance

This graph provides a view of Task endurance and whether Jane is consistent in her work or not.

The graph shows immediately that Jane's behaviour is very inconsistent and she struggles to manage her time and work. Even the least-difficult tasks are being performed inconsistently and this type of result is an indicator for the manager that Jane is in need of time-Management skills and coaching.

Often an employee with a high potential for completing difficult tasks is not identified due to his or her shortcomings in time- and task-Management.

- **Conclusions**

Engineering Control Theory has provided a basis for measuring performance based on very simple, but highly effective tools. These tools, Gain, Transfer Functions, Variance, etc. provide the avenue for effective Management of employee performance by establishing objective paths and key indicators of the behaviour of each employee. The graphical representation is especially beneficial in that it portrays the trends of behaviour as well as 'objectifies' the results, making feedback to the employee easier to relay and easier to 'digest' on the part of the employee. A feedback session which can orbit around these results opens the channels for constructive communication and constructive feedback, even if criticism is necessary.

The overall result of this approach is a far more honest and open dialogue between manager and employee. Such an environment is far more conducive to improved productivity and improved interactions between Management and staff.

## 4.5 Conclusions

In order to conclude this chapter effectively, a brief summary of the topics discussed is presented first:

Chapter 4.1 introduced the topic of a Unified Theory of Management and highlighted the presence of the concept of Feedback throughout the literary canon of Management Theory.

Chapter 4.2 provided an analysis of Management Theory in developing economies such as South Africa and introduced the concept of Ubuntu Management. Key factors contributing to improving Management practices in South Africa were identified. The cultural influences on Management were also highlighted.

Chapter 4.3 revisited the concept of Feedback and the hypothesis was introduced that Feedback is the ideal communication mechanism or tool.

Chapter 4.4 provided a reductionist approach to common Management scenarios from the perspective of Engineering Control. Examples were brought on how using concepts taken from Engineering Control can be used to solve some of the challenges facing Management Theory as well as the practice of Management itself.

The aim of this Chapter was to provide the reader with an argument that develops over the course of the Chapters above. This argument can be summarized as follows:

1. Research has shown the need for a Unified Theory of Management
2. As a first step towards this unification, Feedback is already an established norm of Management.
3. Management in countries like South Africa are in need of a Management style which centres on effective communication between Management and staff.
4. Feedback, as a mathematical principle of Engineering Control, is the ideal communication platform for effective Management in such an environment.
5. Applying basic concepts from Feedback can be effective in resolving many of the current challenges facing Management in South Africa as well as other more developed economies.

Therefore in conclusion, a basis for unification within Management Theory exists in the principle of Feedback and most of the work in establishing this ‘norm’ has already been achieved. This is the ideal stepping stone towards uniting the various Management ‘schools’, professions and disciplines. Recommendations on how to utilise this approach within Management Theory and Management practices are presented in the succeeding chapter.

# 5 CONCLUSIONS AND IMPLICATIONS

## 5.1 Introduction

The research that has been conducted in this dissertation has explored the subject of Management and in particular, Management Theory. 'Data' in the form of academic journals and books has been analysed to uncover the way to address the challenges facing Management Theory as well as Management practises in South Africa. This study has been conducted from an 'Engineering perspective' and correlations with Engineering Control Theory have been drawn. This chapter presents the findings and conclusions of this study, as well as making recommendation for further developments within research and practise.

## 5.2 A Brief Overview of Previous Chapters

There has recently been a major global trend for professionals to pursue 'Management knowledge' in the form of MBA's and the like, as well as a wave of books, articles, etc., written by corporate leaders on the topic of Management. Engineers have also "answered the call" to further their careers by pursuing tutelage in Management practises and expertise.

Management Theory has been the subject of academic scrutiny for over a century and the history of the field is rife with discussion, debate and critical analysis.

An analysis of the historical development of the subject showed that theorists are divided between the 'socio-psychological' perspective and the 'systems' perspective. The fundamental difference between them being on whether Management forms part of the Humanities or the Sciences. The Systems Model of Management relates to the organization as a 'machine-system', where the employees are merely tools or components that occupy the system with their respective roles and responsibilities. The Socio-Psychological Model relates to the 'humanistic' aspects of the organization, focusing on 'what makes people work better', rather than looking at mathematical formulae to govern people's behaviour. This 'rift' has created various challenges for the field of Management Theory. Many theorists have suggested that the future of Management Theory rests on the willingness of the academic community to unite and 'unify' the various streams of Management Thought.

In South Africa, a country with a history of ethnic conflict and cultural tension, Management theories have the added challenge of needing to accommodate for these cultural differences and contribute towards creating harmony within these organizations. The *Ubuntu* philosophy of Management has

been identified by many as the appropriate paradigm to affect such change within South African organizations, a philosophy that centres on a 'communal' perspective that advocates the building of an open and trusting relationship between management and staff. This is achieved through transparency, a commitment towards shared values and concretising the goals of the organization as a strategy that looks to improve the quality of life for the community as a whole, with all of its 'inhabitants' being equally responsible for its success.

The question is then posed: What is the place of Engineering in the advancement of a relevant, comprehensive and effective theory of Management that is also relevant to a Management environment like South Africa?

The research methodology adopted in this study is based on the Grounded Theory of Qualitative Research whereby, an analysis of the data looks to identify links, or linkages, between core concepts found in Control Theory and Management Theory. Journal articles as well as textbooks were chosen as the sample of data and the scope was limited to those articles relating to the historical development of Management Theory, critiques or criticisms of Management Theory, and articles relating to Management issues within South Africa.

This analysis yielded the following results:

1. Unified Theory of Management
    a. Theorists have suggested that a unified theory of Management is needed in order to resolve the challenges facing Management Theory
    b. The first step in establishing a unified theory is in defining what to include in the scope of Management Theory and similarly, what to exclude from Management Theory.
    c. In order to reduce or eliminate disagreement, the process for unification should begin with discussions on what the academic community is already in agreement with.

2. Feedback in Management
    a. Feedback is accepted universally as axiomatic in Management.
    b. Not only is Feedback recognised as an effective Management 'tool', it is fundamentally necessary for effective Management as a whole.

3. Management in South Africa
    a. Management in South Africa is both complex and complicated.
    b. Researchers have looked to Ubuntu philosophy for ways of coping with the cultural and ethnic factors influencing management practises.

c. Ubuntu , or Afrocentric, Management stands in contrast to Western, or Eurocentric, Management in that it focuses on the 'communal' aspects of the organization and promotes open and honest communication between the various hierarchal structures; the aim being to create a culture of comradery, shared goals and a shared responsibility in achieving success.
d. According to Ubuntu Management, an organization will succeed in its management endeavours based on two criteria:
    i. Communication – the effectiveness of communication across the organization.
    ii. Self-identification – the extent to which employees identify with the goals and objectives of the organization.

Applying a conceptual perspective of the Control Model of Feedback, found in Engineering Control Theory, Feedback is identified as an ideal model for communication within systems. The Control Model can be applied to almost any system, including that of a Management system. By reducing the model to its core principles, Feedback provides the means to effectively 'manage' the output of a defined system. An organization can as such also be reduced in a similar fashion.

The results of this perspective are that one is able to conceptualise the organization in terms of its Feedback processes and in addition, apply certain "Feedback Values" to the organization in order to improve the collective 'consciousness' of the employees.

Examples are brought using some of the common or 'basic' Management scenarios. These examples show various aspects of the Feedback 'style' of Management, namely:

1. Graphical depiction – utilising the visual aspects of Feedback loops as a means of strengthening a collective 'view' of the organization. In addition, this visualisation aids in eliminating the portrayal of management as being 'superior' to the other employees.
2. Addressing cultural barriers, such as language and gaps in educational background, Feedback provides a way of communication that accommodates for various ethnic differences, as well as contributing towards an Ubuntu perspective of the organization.
3. Mathematical formulae – applying the mathematical principles used in Control, but from a Management perspective, provides tools for Performance Measurement.

Conclusions drawn from the study are that Feedback is an ideal starting point for the unification of Management Theory in that it is an already-established 'norm' of Management and is universally accepted by the various academic institutions of Management.

Similarly, Feedback is identified as being an effective method for resolving many of the challenges facing South African managers and contributes extensively towards the Ubuntu 'goal' of Management.

## 5.3 Conclusions about the Hypothesis and Research Question

### 5.3.1 Introduction

The question that sparked the inquiry undertaken in this dissertation came as a response to the recent abundance of publications on the subject of Management and the growing trend for Engineers and others, to pursue further education in Management in the form of MBA degrees. The following chapter discusses the question and hypothesis explored within this study and the conclusions thereof.

### 5.3.2 Review of the Research Question

The primary question addressed in this study is whether Engineering Theory can offer any valuable contribution to the field of Management Theory. It was hypothesized that Engineering Theory can indeed play a significant role in the development of this field and moreover, provide a perspective that could ultimately solve some of the obstacles facing Management Theory.

An inquiry into the historical development of Management Theory has uncovered a lack in the unity amongst theorists and unwillingness to unify the body of Management knowledge. This has in turn, enabled various challenges that face Management research and the 'validity' of Management theories for organizational practise.

In South Africa, Management theories must be able to cope with a multicultural and diverse workforce and the Ubuntu or Afrocentric 'style' of Management has been suggested to assist in the challenges facing South African managers. This type of Management rests on two pillars:

1. **Communication** – the effectiveness of communication across the organization
2. **Self-identification** – the extent to which individuals identify with the vision and specific goals of the organization

Addressing both the issues of i) the need for unification of Management Theory, and ii) the need for South African organizations to establish a culture that boasts a shared and common goal; Feedback is suggested as the ideal candidate.

The road towards unification must begin by initiating dialogue between the various Management 'schools of thought'. This conversation can only productively begin with establishing a shared platform that emphasizes what the academic community already agrees on with regard to Management Theory. Feedback is already primed for such a task in that:

i. It is a universally accepted basis for effective Management
ii. It has been consistently recognised by all the various disciplines
iii. Its terminology (semantics) is familiar to both the Scientific and Sociological communities
iv. It is continuously being researched

Feedback, as it appears in the Engineering Model of Control, embodies the very essence of effective communication and is an already-established tenet of Management philosophy and is found in all forms of Management practise. In addition, Feedback carries with it, no bias or agenda in that it is used within the realm of Engineering Science. As such, applying the principles of Feedback to management scenarios in South Africa and the like, can help eliminate cultural and language barriers that impede effective Management.

In conclusion, the role of Engineering Theory in the development of Management Theory is in the 'dissecting' of Engineering concepts such as Feedback, applying and testing them in the Management arena and providing tools for making Management itself, a more palpable and tangible field of study.

### 5.3.3 Collaboration between Theory and Practice

The research conducted on the subject of Management is vast and extensive. However, it is unlikely that the place of the "non-academic" works on Management (i.e. books) will become redundant. There is a benefit in having experiential accounts of Management successes or failures as a basis for analysis and research (however, not as a basis for a unified theory) and there needs to be somewhat of a collaboration between these two communities.

Academic institutions need to work more closely with industry and those publication houses already doing research into Management personalities and their experience in practicing Management in its various forms and environments. The 'laboratory' of Management Science is within each and every organization that practices Management and it is precisely this 'data' that the academic community should be harvesting to further develop the Theory and all of its intricate details.

### 5.3.4 Concluding Remarks

The Control Model of Feedback stands at the basis of establishing a Unified Theory of Management. This unification will ultimately lead to a consolidation of the various fields of Management research. Following this, a unified body of knowledge can be established as the basis for Management theory and the practical applications within the organizational environment. This, along with a collaboration with industry, will lead to the successful practice of Management and provide the means for which the subject can be developed further, enriched and optimised.

For South Africa, the "Rainbow Nation", Management Theories can adopt the principles of Feedback as a way of achieving the 'spirit' of *Ubuntu* and establishing an organizational culture that embodies honour, trust, mutual respect and a collective unity towards a common goal.

## 5.4 Research Implications

### 5.4.1 Implications for Theory

- **Unified Theory of Management**

The argument has been made that a tremendous effort needs to be made into the unification of Management Theory. The steps to achieve unification have been suggested by contributors such as Koontz (Koontz, 1961, 1980), Rosenzweig (Kast & Rosenzweig, 1972), and others. These need to be revisited and more importantly, a unified body needs to be established that represents the various professions and bodies that are involved in Management research. This body must have the charge of ensuring a consolidated, democratic constitution of Management thought. The specific deliverables of such a body are suggested as follows:

i. Achieving a single representative voice for the academic community on Management Theory
ii. Defining a body of knowledge for Management Theory research
iii. Establishing a unified semantic language of Management i.e. terminology.
iv. Managing the relationship with industry and other external bodies

- **Elimination of Gap-filling Research**

In addition, the research paradigm of Management Theory needs to be revolutionised. "Gap-filling" as mentioned in Chapter 2.2.9 must be minimised as much as possible by the academic community. A push for innovative and revolutionary ideas must be encouraged and incentivised.

- **Control Model Research**

Applying a conceptual perspective on Control Theory can be researched further. The Control Model, as previously mentioned, is an already accepted norm within Management Theory. This can be researched as its own field of study and the laboratory for such experimentation is already well-established in industry and collaborative initiatives could yield very constructive results and enable a rapid development of the Theory itself.

- **Management Theory in South Africa**

Greater investments needs to be made into Management Theory in South Africa. The country is currently suffering from a tremendous lack of dialogue between 'manager' and 'employee' (Booysen, 2007; Cant & Wiid, 2013). In particular, the mining and manufacturing sectors are underperforming to an extent that casts tremendous pessimism for foreign investors (see Appendix H). Chapter 4.2 discussed the cultural uniqueness of the South African environment and more effort needs to be made into Management research in South African institutions and organizations. A South African 'style' of Management needs to be developed thoroughly and the institutions teaching Management Theory should be reducing the Western influences in favour of South African ones. It is important to note that the longer this transition, the more difficult the transition will be. Governmental and commercial funding must be highlighted as being essential to the success of this endeavour.

### 5.4.2 Implications for Practice

- **Feedback in South African Organizations**

South African organizations are in need of some form of a "socio-economic revolution". The unique skills of the South African society are not being cultivated and harvested in the corporate market and the factors that have contributed to the only 'real' democratic economy on the continent have not been capitalised. A result of the Apartheid era, the lack of basic education has made the corporate environment in South Africa, a place of confusion, mistrust and altogether ineffective communication. A Western-style of Management has clashed with the Ubuntu culture and the result is a "tug-of-war" between the "Western Manager" and the "Ubuntu-workforce".

Critical to resolving this conflict is the subject of Feedback. If organizations are able to effectively communicate a culture of transparency, equality and collective-ambition, this will eliminate worker-apathy, distrust of Management and particular, performance Management. The centricity of Feedback within the organizational is pivotal to achieving this Cultural Revolution. Feedback-seeking behaviour and creating an environment where Feedback, in the constructive sense, will produce the backdrop for

a more harmonious interaction between the various cultures and ethnic groups and the cultural diversity will not only be accepted, but appreciated and respected.

The examples presented in this dissertation were few and simplified in order to make the argument more palatable to the reader and the concepts understood. Research into the applications within these and other Management scenarios has boundless potential and special effort needs to be made in order to fully actualise this methodology.

- **Feedback in Organizational Design**

On a universal level, Feedback is an already-established axiom of any Organizational Design. In particular, Organizational Processes and Operations Management research has emphasised the need for Feedback mechanisms within the organization that feed data about the operations to Management so that corrective action may be taken where necessary.

In more recent years, the place of the CRM has taken on a more significant role in Operations Management. Such systems are usually designed on the basis of the Feedback principle but could be improved where Feedback is not commonly found in such industries.

Lastly, an emphasis on graphical repetitions and communication (See Chapter 4.4) within Organizational Design will be beneficial in developing economies or organizations which have various cultural or ethnic representation. Although English is accepted as the universal language of commerce, it is important that a "language-neutral" form of communication is prevalent within organizational practice.

## 5.5 Research Limitations

The limitations of the research in this dissertation are predominantly 'self-imposed' and part, a function of the broad and conceptual perspective adopted in the research itself.

As stated previously, it not the aim of this analysis to fully cover the subject of Management Theory in its entirety, nor fully describe the subject with all of its intricate subtleties.

The limits imposed on the subject where aimed at providing a concise yet focused view on the topic of Management Theory and equip the reader with the tools to understand the challenges facing the field of Management Research and Practice on a holistic level. In particular, the research into the history of Management Theory was reduced to what are seen as the primary contributors in terms of revolutionary influence i.e. those contributions that revolutionised the subject by introducing new

paradigms and concepts that shifted the trajectory of Management thought. This is by no means exhaustive and many great scholars and researchers were unfortunately excluded from being mentioned. This omission was done with a great level of discontent and a feeling of injustice in not mentioning these exceptional leaders in the field of Management Theory.

Similarly, the summary of the challenges facing Management Theory was reduced to a key list of issues that were aimed at the reader not familiar with the subject and was in order to facilitate a "crash-course" encounter with the issues and being able to understand the basis for the arguments presents further.

The analysis of the Control Model was reduced to appeal to the reader not familiar with Engineering Mathematics or the concept of Feedback as it is found in the Control Model. The mathematics themselves are in a sense 'over-simplified' in that the goal was to provide a conceptual understanding of what the mathematics represent, not necessarily what the actual formulae stand to calculate or how the formulae are themselves derived from first-principles.

In short, the limitations of this study were imposed in order to achieve a broader and cohesive understanding of both the subject of Management Theory at large, as well as the conceptual application of Engineering Control Theory to the challenges facing Management practice as well as the ultimate unification of the Theory of Management.

## 5.6 Further Research

The following list serves as recommendations for further research in the specific areas introduced in this dissertation. These also represent the recommended "next-step" in developing the subject and the specific research methodology provided here:

### 5.6.1 Unified Theory of Management

Pollock (Pollock, 2000) provides an excellent overview of one of the approaches in developing a unified theory of Management. This "theme review" of three different books on Management provides an interesting discussion on the topic of "leadership". Research into defining this term "leadership" as fundamental to the unification of the differing schools of Management thought. This term is often a cause of controversy and debate between the more scientific schools and the sociological-psychological perspectives. An investigation into properly defining the term and how it relates to the term "*Management*" needs to be investigated and explored further.

### 5.6.2 Developing the Conceptual Understanding of Feedback (Loops)

The Control Model of Feedback and its applications to Management scenarios has been suggested as the basis for effective Feedback practices in Management. This model needs to be researched thoroughly as well as the mathematics relating to it. This research is unique in that it approaches the subject within the context of its applications to Management. Most, if not all of the current research into the model is from a pure Engineering perspective.

### 5.6.3 Ubuntu Management in South Africa – A Model for Organizational Design

Ubuntu Management is a subject that is vital to the development of the South African economy. Clearly, not enough is being done in terms of research into Management in South Africa and specifically, the application of this research into practice. A scientific approach into the subject is needed and formulaic concepts or principles of Ubuntu Management must be developed and catalogued in a format that is easily applied in industrial environments.

### 5.6.4 Developing the Socio-Economic Variable of Management Theory

Despite the reality of a World Economy and globalization in general, the social and cultural relativity if Management practice has been proven extensively. In as far as there is need to Unify the philosophy of Management, there is also an urgent need to incorporate this relativity into the Management Model. Specifically, a variable must be researched that accurately accounts for the socio-cultural factor of the Management "formula". This research will require an in-depth understanding of the effects of these cultural subtleties and how these are incorporated into a holistic managerial perspective.

### 5.6.5 Empirical data for an "Ubuntu-Control" Approach to Organizational Culture

The aim of this dissertation is to introduce the reader to a perspective on Management that incorporates the principles of the mathematical Control model of Systems. It is suggested that this type of approach could potentially resolve some of the pertinent challenges facing organizations in developing economies such as South Africa. Research into the "Ubuntu-Control" approach described in this dissertation should be done in order to obtain empirical evidence of the success or failure of deploying such an approach. If the data supports the hypothesis described above, further research can be justified into further development of the subject.

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# 7 APPENDICES

## APPENDIX A – Henri Fayol's Principles for Management

### Fayol's 14 Principles of Management

Fayol's principles of Management are listed below ("Henri Fayol's Principles of Management," 2009):

1. Division of Work – When employees are specialized, output can increase because they become increasingly skilled and efficient.
2. Authority – Managers must have the authority to give orders, but they must also keep in mind that with authority comes responsibility.
3. Discipline – Discipline must be upheld in organizations, but methods for doing so can vary.
4. Unity of Command – Employees should have only one direct supervisor.
5. Unity of Direction – Teams with the same objective should be working under the direction of one manager, using one plan. This will ensure that action is properly coordinated.
6. Subordination of Individual Interests to the General Interest – The interests of one employee should not be allowed to become more important than those of the group. This includes managers.
7. Remuneration – Employee satisfaction depends on fair remuneration for everyone. This includes financial and non-financial compensation.
8. Centralization – This principle refers to how close employees are to the decision-making process. It is important to aim for an appropriate balance.
9. Scalar Chain – Employees should be aware of where they stand in the organization's hierarchy, or chain of command.
10. Order – The workplace facilities must be clean, tidy and safe for employees. Everything should have its place.
11. Equity – Managers should be fair to staff at all times, both maintaining discipline as necessary and acting with kindness where appropriate.
12. Stability of Tenure of Personnel – Managers should strive to minimize employee turnover. Personnel planning should be a priority.
13. Initiative – Employees should be given the necessary level of freedom to create and carry out plans.
14. Esprit de Corps – Organizations should strive to promote team spirit and unity.

## APPENDIX B – Boulding's Hierarchy of Complexity

**Boulding's Classification of Systems** (Boulding, 1956)

1. Frameworks. The geography and anatomy of the universe : the patterns of electrons around a nucleus, the pattern of atoms in a molecular formula, the arrangement of atoms in a crystal, the anatomy of the gene, the mapping of the earth, etc.
2. Clockworks. The solar system or simple machines such as the lever and the pulley, even quite complicated machines like steam engines and dynamos fall mostly under this category.
3. Thermostats. Control Mechanisms or Cybernetic Systems: the system will move to the maintenance of any given equilibrium, within limits.
4. Cells. Open systems or self-maintaining structures. This is the level at which life begins to differentiate itself from not life.
5. Plants. The outstanding characteristics of these systems (studied by the botanists) are first, a division of labour with differentiated and mutually dependent parts (roots, leaves, seeds, etc.), and second, a sharp differentiation between the genotype and the phenotype, associated with the phenomenon of equifinal or "blueprinted" growth.
6. Animals. Level characterized by increased mobility, teleological behaviour and self-awareness, with the development of specialized 'information receptors (eyes, ears, etc.) leading to an enormous increase in the intake of information.
7. Human Beings. In, addition to all, or nearly all, of the characteristics of animal systems man possesses self-consciousness, which is something different from mere awareness.
8. Social Organizations. The unit of such systems is not perhaps the person but the "role" - that part of the person which is concerned with the organization or situation in question. Social organizations might be defined as a set of roles tied together with channels of communication.
9. Transcendental Systems. The *ultimates* and absolutes and the inescapable *unknowables* that also exhibit systematic structure and relationship.

## APPENDIX C – Koontz's Twelve Principles of Control

**Principles of Control** (Rao, 2014)

An excerpt from http://nraomtr.blogspot.com/2011/12/principles-o-principles-of-management.html

1. **Principle of assurance of objective**

The task of control is to assure accomplishment of objectives by detecting potential or actual deviation from plans early enough to permit effective corrective action.

2. **Principle of efficiency of controls**

The more control approaches and techniques detect and illuminate the causes of potential or actual deviations from plans with the minimum of costs or other unsought consequences, the more efficient these controls will be.

3. **Principle of control responsibility**

The primary responsibility for the exercise of control rests in the manager charged with the execution of plans.

4. **Principle of direct control**

The higher the quality of managers and their subordinates, the less will be the need for indirect controls.

(The principle may termed as principle of reduced controls. A superior can spend less time in control activities if he has higher quality managers and their subordinates in his department.)

5. **Principle of reflection of plans**

The more controls are designed to deal with and reflect the specific nature and structure of plans, the more effective they will serve the interests of the enterprises and its managers.

6. **Principle of organizational suitability**

The more controls are designed to reflect the place in the organization structure where responsibility for action lies, the more they will facilitate correction of deviation of events from plans.

7. **Principle of individuality of controls**

Controls have to be consistent with the position, operational responsibility, competence, and needs of the individuals who have to interpret the control measures and exercise control.

8. **Principle of standards**

Effective control requires objective, accurate, and suitable controls.

9. **Principle of critical-point control**

Effective control requires attention to those factors critical to appraising performance against an individual plan.

10. **The exception Principle**

The more a manager concentrates his control on exceptions, the more efficient will be the results of this control.

11. **Principle of flexibility of controls**

If controls are to remain effective despite failure or unforeseen changes in plans, flexibility is required in the design of controls.

12. **Principle of Action**

Control is justified only if indicated or experienced deviations from plans are corrected through appropriate planning, organizing, staffing and directing.

## APPENDIX D – Beer's Viable Systems Model (VSM) and Team Syntegrity Protocol (TSP)

**Viable Systems Model (VSM)** (Beer, 1972)

An excerpt from Wikipedia: http://en.wikipedia.org/wiki/Viable_system_model#

A viable system is composed of five interacting subsystems which may be mapped onto aspects of organizational structure. In broad terms Systems 1–3 are concerned with the 'here and now' of the organization's operations, System 4 is concerned with the 'there and then' – strategic responses to the effects of external, environmental and future demands on the organization. System 5 is concerned with balancing the 'here and now' and the 'there and then' to give policy directives which maintain the organization as a viable entity.

- System 1 in a viable system contains several primary activities. Each System 1 primary activity is itself a viable system due to the recursive nature of systems as described above. These are concerned with performing a function that implements at least part of the key transformation of the organization.
- System 2 represents the information channels and bodies that allow the primary activities in System 1 to communicate between each other and which allow System 3 to monitor and co-ordinate the activities within System 1. Represents the scheduling function of shared resources to be used by System 1.
- System 3 represents the structures and controls that are put into place to establish the rules, resources, rights and responsibilities of System 1 and to provide an interface with Systems 4/5. Represents the big picture view of the processes inside of System 1.
- System 4 – The bodies that make up System 4 are responsible for looking outwards to the environment to monitor how the organization needs to adapt to remain viable.
- System 5 is responsible for policy decisions within the organization as a whole to balance demands from different parts of the organization and steer the organization as a whole.

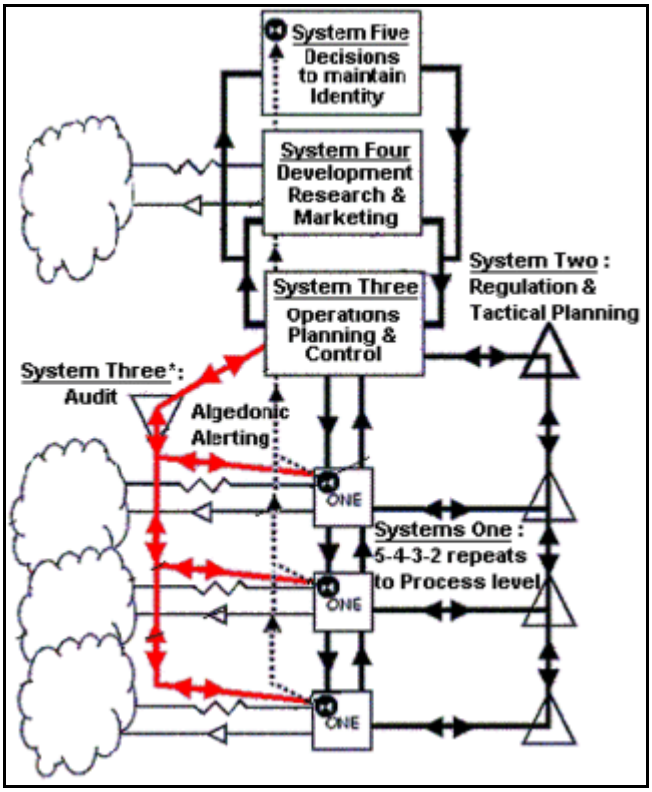



Figure 20: Viable Systems Model (VSM)

**Team Syntegrity Protocol (TSP)** (Boulding, 1956)

An excerpt from Wikipedia: http://en.wikipedia.org/wiki/Syntegrity

Team Syntegrity is a meeting protocol to support the encounter of about 30 people in a non-hierarchical set up. It supports a strong exchange of personal knowledge and experience, giving to all participants the chance to contribute to the best of their abilities to the purpose of the project. Briefly the steps of the protocol can be described as follows:

- Proposing and opening question and the constitution of an infoset. The opening question emerges from the purpose of the meeting. The infoset is the group of people contributing to the meeting.
- Participants are asked to contribute individually with "Statements of Importance" (SI) relevant to the purpose of the collaboration.
- Based on these SIs, participants elaborate aggregated statements of importance (ASI). These are statements emerging from participants' interactions, supported by several of them, rather than by single individuals. This is achieved in a market place of ideas. Participants jostle and achieve support of 4-5 people to what they considered relevant to the purpose at hand. This way hundreds of SIs may be reduced to tens of ASIs.

- The participants are then asked to relate ASIs in triplets and doublets of associated ASIs, that is, the ASIs are combined in groups that seem to address the same topic. The purpose is to reduce the ASIs to up to 12 Consolidated Statements of Importance (CSIs) by a process of elision. These are the topics for discussion in the meeting.
- A voting procedure follows to enable each participant to express his/her preferences for the topics.
- Based on the voting, topics are allocated to participants using a computer supported algorithm. Each participant becomes member of two discussion teams, that is, is member of two teams of five, responsible for the elaboration of two topics, and becomes a critic of two other teams. Team members discuss the topics and prepare "Final Statements of Importance" (FSI). Critics observe a team's discussion and contribute as requested to improve the quality of this discussion. Critics are free to discuss with the team members during their allocated times, commenting on either the content of the discussion or on the process of the meeting.
- Teams discuss the topics in three meetings, moderated by facilitators, who may also support the documentation of these discussion, for instance using flip-charts. Each meeting ends up with a summary. The last of the three Outcome Resolves, as these meetings are called, ends up with the teams' Final Statement of Importance. Intermediate outcome resolve statements are made available to all participants, to enhance the reverberation of ideas in the infoset.

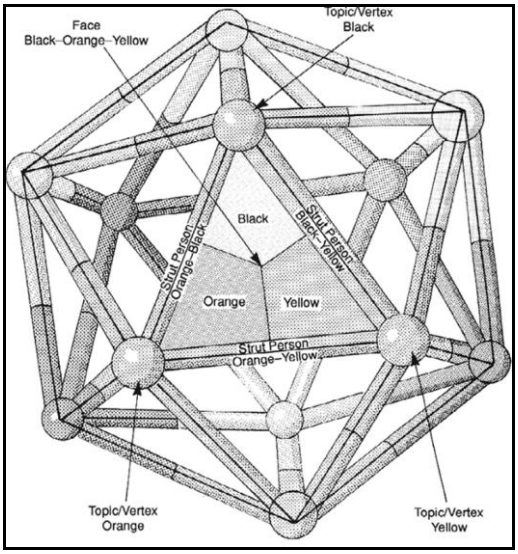



Figure 21: The Syntegrity Icosahedron

## APPENDIX E – Marikana

**Marikana prequel: NUM and the murders that started it all** (Sacks, 2012)

An excerpt from Wikipedia: http://en.wikipedia.org/wiki/Marikana_miners%27_strike

The Marikana miners' strike or Lonmin strike was a wildcat strike at a mine owned by Lonmin in the Marikana area, close to Rustenburg, South Africa in 2012. The event garnered international attention following a series of violent incidents between the South African Police Service, Lonmin security, the leadership of the National Union of Mineworkers (NUM) and strikers themselves, which resulted in the deaths of 44 people, the majority of whom were striking mineworkers killed on 16 August. At least 78 additional workers were also injured on 16 August. The total number of injuries during the strike remains unknown. In addition to the Lonmin strikers, there has been a wave of wildcat strikes across the South African mining sector.

The first incidents of violence were reported to have started on 11 August after NUM leaders opened fire on NUM members who were on strike. Initial reports indicated that it was widely believed that two strikers died that day; however, it later turned out that two strikers were seriously wounded, but not killed, in the shooting by NUM members. This violence was followed by the death of another eight strikers, police and security personnel who were killed in the next three days.

The shooting incident on 16 August that the press dubbed the Marikana massacre was the single most lethal use of force by South African security forces against civilians since 1960, and the end of the apartheid era. The shootings have been described as a massacre in the South African media and have been compared to the Sharpeville massacre in 1960. The incident also took place on the 25-year anniversary of a nationwide South African miners' strike.

Controversy emerged after it was discovered that most of the victims were shot in the back and many victims were shot far from police lines. On 18 September, a mediator announced a resolution to the conflict, stating the striking miners had accepted a 22% pay rise, a one-off payment of 2,000 rand and would return to work 20 September.

The Strike is considered a seminal event in modern South African history, and was followed by similar strikes at other mines across South Africa, events which collectively made 2012 the most protest-filled year in the country since the end of apartheid.

## APPENDIX F – Mining, Manufacturing and Foreign Investment

**Foreign investors still wary of challenges facing mining projects in Africa** ("Foreign investors still wary of challenges facing mining projects in Africa," 2014)

There appears to be a significant lack of foreign investment capital to develop mining projects in Africa. The continent still poses too many challenges to investors – and these obstacles are growing as African governments mature.

"While foreign investors are reticent to invest in Africa, there is massive opportunity for mining throughout the continent, and as infrastructure grows, so mining will grow," says Lauren Patlansky, managing director of Grant Thornton's Asia Business Services.

The Grant Thornton Global Mining Survey for 2014, which captures industry sentiments about mining trends affecting the industry and individual mining businesses, identified 52 different countries where mining assets are located around the world. The majority of assets reported in the survey were in Australia (33% of the respondents surveyed), USA (28%) and Canada (27%). Approximately 19% of miners who participated in the 2014 survey indicated that they have assets located in South Africa.

The major challenges associated with foreign mining investment into Africa remain political, economic and regulatory uncertainty. In addition, black economic empowerment (BEE) regulations in many African countries and aggressive unionisation in South Africa make foreign direct investment (FDI) increasingly unattractive to global investors who are turning their attention elsewhere.

Grant Thornton's 2014 Global Mining Survey reveals that the factors which are constraining miners' abilities to expand / growth their organisations are increased government involvement / regulations (39% of all respondents stated this as a constraint), volatile commodity pricing (26%), access to funding (10%) and permitting or processing procedures (9%).

**Table 1: To what extent are the following constraining your ability to expand/grow your organisation?** *Global results – Grant Thornton Global Mining Survey 2014*

| **Rank** | **% of respondents** |
|---|---|
| Increased government involvement/regulations | 38.7% |
| Volatile commodity pricing | 25.7% |
| Access to funding | 9.9% |
| Permitting/processing procedures | 9.1% |
| Volatile energy and fuel costs | 2.0% |

Mining companies that should have been in production throughout Africa by now have had timelines stretched by years because of a variety of challenges. These delays are prohibitively costly.

"The challenges are not new, but they are becoming more onerous," says Patlansky. "African governments have matured and as a consequence, they are making it more challenging for foreign investors to access their resources, compared to in the past. They are far more cautious about foreign investment, having learnt the hard way."

Today, South Africa has strict BEE regulations, while Zimbabwe has an indigenisation policy and requires compliance certification for all business operating in the country.

"Africa is protecting its own people and governments are no longer giving away Africa's resources and wealth," says Patlanksy.

The Global Mining Survey highlighted that the factors which are most constraining South African miners are increased government involvement and regulations (45%) – a constraint which is clearly affecting mining on a global scale – volatile commodity pricing (37%) and a shortage of skilled / experienced workers (31%).

Uncertainty surrounding the mineral regulatory regime also keeps investors at bay. Governments are clamping down and introducing strict FDI regulations which make investing trickier. Often, the exact nature of legislation in the pipeline is too vague for a clear understanding of its implications.

There is also a significant move in many African countries to enforce local beneficiation. Zimbabwe now has strict beneficiation laws and investors can no longer export manganese and iron ore in its raw form.

In South Africa, the proposed Mineral and Petroleum Resources Development Amendment Bill of 2013 authorises the minister of Mineral Resources to decide which, and how many, minerals must be locally beneficiated.

These regulations, imposed to ensure job creation, do nothing to attract foreign investors as beneficiation is significantly cheaper in other countries, such as China.

The threat of religious, tribal and political wars plays a key role in keeping foreign investment away. Whereas manufacturers can erect a plant, manufacture for a few years and then pull out in the case of unrest, mining is a major long-term investment difficult to walk away from should war erupt.

The recent violent resurgence by Renamo in Mozambique, after more than 20 years of peace, is just one of many examples of the volatility of the continent.

Lack of good infrastructure remains a critical challenge throughout Africa. While South Africa generally offers excellent infrastructure, there are still major challenges. One of the biggest is the inability for foreign companies to move coal out of the country. Cartels own the rail infrastructure to Richard's Bay and there is little allocation for foreign companies.

A challenge unique to South Africa is the unionisation of the mining industry.

"There is no doubt that our unions scare off foreign investors," says Patlansky. "Companies need to take the unions into account when doing financial long-term calculations. For example, they need to take into account what possible strikes could occur and at what cost, over the next ten years.

"The rest of Africa is not unionised and many investors choose to face the many pitfalls in other African countries, including political instability, rather than risk industrial unrest with its financial and reputational costs."

While there has been a slowdown in foreign investment by the United States and the European Union recently, China increased its global outbound FDI spend to a record US$87,8 billion for the year to September 2013.

"China has a strong appetite to invest in mining in Africa," says Patlansky. "Chinese State-owned enterprises have the funds available to withstand the risks of investment into Africa."

Patlansky adds that the weak South African rand may further stimulate foreign investment interest and it will probably make the country a more lucrative destination for Chinese investors to consider.

In South Africa right now there are many smaller companies, some of which were never involved in mining formerly and looked to diversify, are now battling to secure funding for their exploration projects. Minerals are worth nothing under the ground, no matter how promising, and these junior miners who are nowhere near production are facing huge challenges.

“Five years ago, when mining was booming, many jumped into the industry with exploration projects,” says Patlansky. “They listed on the Stock Exchange and invested their own funds but are now struggling to raise the appropriate funding.

The Grant Thornton Global Mining Survey also reviewed miners internationally who are considering exiting the industry. The global research indicated that 12% of respondents expect their companies will be sold or taken over in the next 12 months, 17% state they will complete a partial sale or recapitalisation in the next year, 19% will sell a unit or division and a startling 27% will sell material claims or projects in the coming 12 months.

Approximately 12% of the South African mining executives surveyed indicate that a sale or takeover is likely, with 10% of miners expecting to go under administration while 16% are sadly likely to temporarily halt operations.

“In today’s economy, African mining companies would do well to remember that companies with capital seek more advanced projects that have less lead time and less risk,” she concludes.

*Issued by Strat Comms on behalf of Grant Thornton South Africa*

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