

https://dspace.org/

The impact of exponential organisation methods on productivity in the marketing department of a South African telecommunication organisation

Sebone, Khutšo M

2020
https://hdl.handle.net/10539/30309

Downloaded from a DSpace repository. https://dspace.org/

The impact of exponential organisation methods on productivity in the marketing department of a South African telecommunication organisation

Khutšo M Sebone

Student No. 1789184

Email : 1789184@students.wits.ac.za

Mobile No. 072 565 6161

A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Management in the field of Digital Business

Johannesburg, 2019

C2 General

(Version 2019-2020)

C2 General

ABSTRACT

The world is progressing into the fourth industrial revolution; this era is also known as the digital era. Digitalisation has shown to improve not only operations but also customer experience. Exponential organisations are organisations which effectively exploit information abundance, technology and new leadership style to disrupt industries and yield 10X returns. The concept of exponential organisation and its claim of yielding 10X lacks academic literature most notably in the productivity field. This study aims to demonstrate using an analytical efficiency model Data Envelopment Analysis to analyse the impact of exponential organisation methods have on productivity in the telecommunication sector.

The study is based on an experimental research design, exponential organisation lite methods were implemented within a marketing department. Kurt Lewin change management was used to implement the exponential organisation methods, the change management model provided a controlled environment with minimal productivity interruptions. Exponential methods MTP and Dashboards were implemented in two out of eight decision-making units. Golany and Cronbach Alpha were used to validate the reliability of the collected data.

Through the application of data envelopment analysis tool, the collected data was analysed. The two decision-making units of concern yielded 3X and 5X efficiency improvement after exponential organisation methods were implemented.

In conclusion, the obtained results were positive, the study needs to be continued on a longer time frame therefore allowing for all exponential organisation lite methods to be implemented.

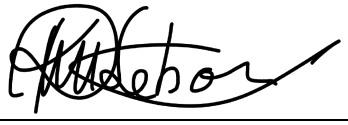
KEY WORDS

Data envelopment analysis, MTP, Dashboards, exponential organisations, efficiency

C2 General

DECLARATION

I, _Khutšo M Sebone_, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in the field of Digital Business at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Name: Khutšo M Sebone Signature: 

Signed at Polokwane

On the 29 day of October 2020.

C2 General

DEDICATION

C2 General

ACKNOWLEDGEMENTS

Left intentionally

C2 General

TABLE OF CONTENTS

ABSTRACT ..... **iii**

DECLARATION ..... **iv**

DEDICATION ..... **v**

ACKNOWLEDGEMENTS ..... **vi**

LIST OF TABLES ..... **x**

LIST OF FIGURES ..... **xi**

LIST OF ABBREVIATIONS AND ACRONYMS ..... **xii**

CHAPTER 1. INTRODUCTION **13**

1.1 PURPOSE OF THE STUDY 13
1.2 CONTEXT OF THE STUDY 14
1.3 RESEARCH PROBLEM 15
1.4 RESEARCH OBJECTIVES 16
1.5 SIGNIFICANCE OF THE STUDY 16
1.6 DELIMITATIONS OF THE STUDY 17
1.7 DEFINITION OF TERMS 17
1.8 ASSUMPTIONS 19

CHAPTER 2. LITERATURE REVIEW **20**

2.1 BACKGROUND DISCUSSION 20
2.2 INTRODUCTION 21
2.3 OUTLINE AND IMPLEMENT THE CHARACTERISTICS OF EXO 25
2.3.1 MASSIVE TRANSFORMATIVE PURPOSE 25
2.3.2 SCALE 26
2.3.3 IDEAS 29
2.3.4 PROPOSITION 31
2.4 ANALYSE THE EXO IMPACT ON PRODUCTIVITY 31
2.4.1 DEA 32
2.4.2 HYPOTHESIS 34
2.5 CONCLUSION OF THE LITERATURE REVIEW 35

C2 General

CHAPTER 3. RESEARCH METHODOLOGY 36

3.1 RESEARCH APPROACH 36
3.2 EXPERIMENTAL RESEARCH DESIGN 39
3.3 DATA COLLECTION METHODS 41
3.4 POPULATION AND SAMPLE 42
3.4.1 POPULATION 42
3.4.2 SAMPLE AND SAMPLING METHOD 42
3.5 THE RESEARCH INSTRUMENTS 43
3.5.1 PRODUCTIVITY INSTRUMENT 43
3.5.2 EXO IMPLEMENTATION 46
3.6 PROCEDURE FOR DATA COLLECTION 48
3.7 DATA ANALYSIS AND INTERPRETATION 49
3.8 LIMITATIONS OF THE STUDY 49
3.9 VALIDITY 51
3.9.1 EXTERNAL VALIDITY 51
3.9.2 INTERNAL VALIDITY 52
3.9.3 RELIABILITY 52
3.10 DEMOGRAPHIC PROFILE OF RESPONDENTS 52

CHAPTER 4. PRESENTATION AND DISCUSSION OF RESULTS 54

4.1 INTRODUCTION 54
4.2 RESULTS PERTAINING TO PROPOSITION 54
4.2.1 FEEDBACK FROM THE MTP 54
4.2.2 FEEDBACK FROM DASHBOARDS 57
4.3 RESULTS PERTAINING TO HYPOTHESIS 60
4.4 SUMMARY OF THE RESULTS 62

CHAPTER 5. CONCLUSIONS & RECOMMENDATIONS 63

5.1 INTRODUCTION 63
5.2 CONCLUSIONS REGARDING RESEARCH OBJECTIVE 1 63
5.3 CONCLUSIONS REGARDING RESEARCH OBJECTIVE 2 65
5.4 RECOMMENDATIONS 66
5.5 SUGGESTIONS FOR FURTHER RESEARCH 66

C2 General

References 67

APPENDIX A : DEA MATLAB Instrument 74

APPENDIX B : Ethical consideration 76

C2 General

LIST OF TABLES

Table 1: Design advantages and disadvantages 41

Table 2: Research Instrument DEA (Input/Outputs) 43

Table 3: Research instrument normalised Input/Outputs 44

Table 4: Demographic profile 53

Table 6: Sales results (units sold) for different DMU's 56

Table 7: Weekly transaction 59

Table 8: 2018-2020 DMU efficiency results 60

Table 9: Monthly Y-O-Y Output growth 2018 - 2020 62

Table 5: Ethical Issues Source (Creswell, 2014) 76

C2 General

LIST OF FIGURES

Figure 1 : Conceptual Framework 13

Figure 2 : Research approach 36

Figure 3 : Design structure 40

Figure 4 : Kurt Lewin Change model 46

Figure 5 : Procedure for data collection 48

Figure 6: Golany and Roll DEA Validity Procedure 51

Figure 7: Stakeholder structure 55

Figure 8: Look and Feel of the Dashboard 58

Figure 9 : Dashboard transactions per consultant 59

C2 General

LIST OF ABBREVIATIONS AND ACRONYMS

BCC	Bankers Charnes Cooper
CCR	Charnes Cooper Rhodes
CRS	Constant Return Scale
DEA	Data Envelopment Analysis
DMU	Decision-Making Units
ExO	Exponential Organisation
HCU	Hypothetical comparison unit
IDEAS	Interface. Dashboards. Experimentation. Autonomy. Social Technologies
MTP	Massive Transformative Purpose
PCA	Principal component analysis
SCALE	Staff on demand. Community & crowd. Algorithm. Leverage Assets. Engagements
TE	Technical Efficiency
TFP	Total Factor Productivity
VRS	Variable Return Scale
MATLAB	Matrix Laboratory
MIT	Massachusetts Institute of Technology
ETL	Extract, Transform and Load
API	Application Programming Interface
KPI	Key Performance Indicators
OKR	Objective Key Results
NDP	National Development Plan
CEO	Chief Executive Officer
CRM	Customer Relationship Management
ICASA	Independent Communication Authority of South Africa
IT	Information Technology
OPEX	Operating Expense
LP	Linear Programming
HR	Human Resource
SPSS	Statistical Package for the Social Sciences
PGC	Post Graduate Committee
DEAOS	Data Envelopment Analysis Online Software

C2 General

CHAPTER 1. INTRODUCTION

1.1 Purpose of the study

Purpose of this study is the implementation of **ExO methods** to **analyse** its **impact** on productivity in a linear organisation.

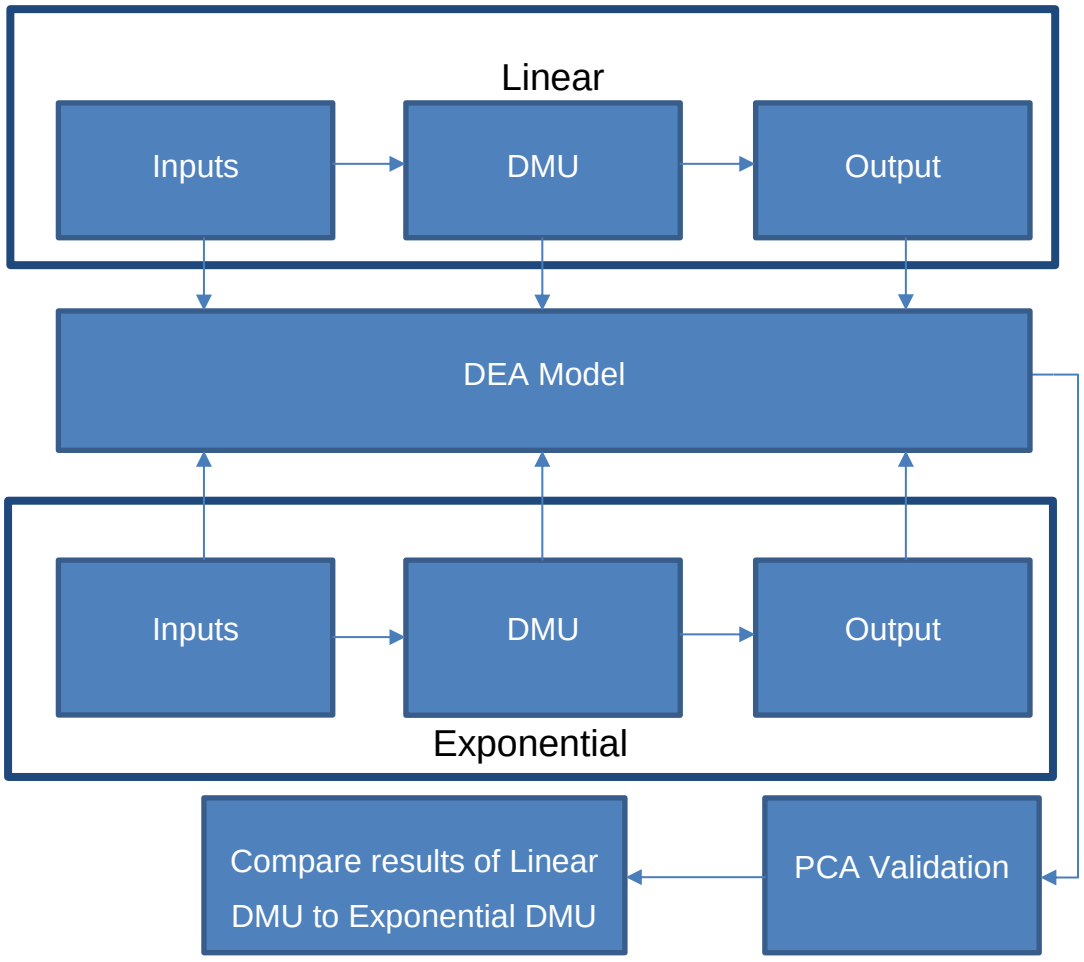


Figure 1 : Conceptual Framework

1.2 Context of the study

The concept of exponential organisations is a huge success in public literature, but the little traction in academic literature should give some perspective(Mohout & Kiemen, 2017). The book exponential organisations into detail highlights the key areas which make up an exponential organisation. Exponential organisation book discusses what future organisations will look like and how the exploitation of information abundance and technology will create a leading role than a follower. The diversity of the service industries has meant that each field has developed its own productivity measures which have often not been widely disseminated due to the lack of standard professional literature(McLaughlin & Coffey, 1990). These linear organisations composed of multiple inputs and outputs but common professional literature for productivity measure is centered around TFP, which is a ratio of labour and capital(Hulten, 2001).

Because the concept of exponential organisation is fairly new it creates a need for more comparative studies to linear organisations. This study explores the implementation of the exponential organisation methods and discusses in brief how these differ from digital transformation which yields different results. Theoretical digitally transformed companies are projected to produce profitability of more than 26% (Westerman, Bonnet, & McAfee, 2014) were exponential organisations are projected to produce ten folds(Ismail, Malone, & Geest, 2014). These theoretical observation does suggest some level of improvement into productivity but is yet to be proven academically.

A non-parametric productive efficiency tool the DEA, because of its multiple inputs and output structure is the ideal efficiency benchmarking tool for service-oriented sectors. The advancements of DEA and fractional linear programming(Färe & Zelenyuk, 2015) made it easier to calculate unit efficiency especifically for sectors with multiple input and output. The outcome of this study will look to measure the productivity efficiency of an organisation in the telecommunication sector in South Africa, and these measures will be taken pre-

C2 General

and post-implementation of the ExO methods into the organisation or business unit.

1.3 Research problem

According to Salim Ismail's book, Exponential Organization(Ismail et al., 2014) companies that embrace digitalisation and agile methods will produce 10X exponential growth in any field of measure, e.g. Market capitalisation, efficiency. Internet companies like Google, Airbnb, Snapchat and many more alike companies have produced market capitalisation of 2,5X (17 years), 5X(6 years) and 10X (3 Years) respectively. Exponential organisations are purpose-led digitised organisations who embrace Experimentation, autonomous processes(Ismail et al., 2014).

Telecommunication companies in the South African market play a critical role(Batuo, 2015) to transformed companies but operate with a different organisational structure. The organisational structures in the South African telecoms market are still highly bureaucratic with a top-down hierarchy structure. The top-down structure stifles autonomy and could harm the organisation's competitive advantage(Ramparsad, 2016), this may result in innovation and Experimentation being centralised. One organisation with such a structure is the observed company in this study. However, it is in the transition to be a flat organisation creating autonomy. This organisation still generate the majority of its revenue from legacy income streams (voice calls) though it is decreasing but not proportional to the data revenue and digital revenue streams.

This study looks to investigate and illustrate through the application of exponential organisation methods and measure any productivity improvements. Through this implementation and measure, we look to propose a realistic plan which looks at the organisation from internal to external in the current organisation vs if the company was an exponential organisation and compare the productivity measure using a DEA model.

C2 General

From the stated objective, the empirical evidence will answer whether the exponential organisation's methods are able to increase productivity by a factor of 10X.

1.4 Research objectives

The objective of this study is to use the exponential organisation (Ismail et al., 2014) methods as formulated by Salim Ismail and demonstrate the impact these will have on the productivity in the telecommunication sector. Because of the nature of the research and the organisational structure in which is linear, the study will be conducted in two sections.

i) Outline and implement the characteristics of ExO(Ismail et al., 2014)
ii) Analyse the ExO(Ismail et al., 2014) impact on productivity.

1.5 Significance of the study

This research seeks to contribute to the re-organisation of telecommunication companies to be future proof not limited to the telecommunication sector but rather in all sectors in the South African market. Companies in the fourth industrial revolution will be scaled to be more flexible and data-driven. This nature will require companies to have a highly flexible strategy with shorter business cycles and eventually a shorter life span. This study should be able to highlight the critical fundamental ExO(Ismail et al., 2014) methods which primarily involves growing the organisation's return by at least 10X factor. Through implementation, the study will be observing any productivity improvements and developing a best practice system. The outcome of the research includes rent do not own, increased trust and transperancy, information centred, disruptive mentality, co-creation and demonetisation and analysis of the technical efficiency, allocative efficiency, relative efficiency and cost efficiency(Banker, Charnes, & Cooper, 1984).

C2 General

1.6 Delimitations of the study

This study is limited to a business unit in the same division but different geographical areas, these business units should be located on the edge of the organisation. Though the methodology may be applicable to any business sector, for the purpose of this study it is limited to the telecoms sector.

In supporting sustainability as per corporate strategy, the change management should be phased in over a more extended period because of culture change which is more psychological therefore more time is needed for adjustment. Thus, this study will be limited to two of the ExO lite methods (MTP & Dashboards) as the permissible period of implementation was four months.

The DEA calculation will be limited to relative efficiency (overall) and technical efficiency (Input & output improvements), and the model applied is VRS.

Some of the delimitations:

i. At a minimum, the input value should be two inputs for a DMU
ii. Input and Output data from 2018 and 2019 October – January

1.7 Definition of terms

Constant Returns Scale	A DEA model which is based on constant input or output variable depending on the orientation (Zhu, 2015) (Charnes, Cooper, & Rhodes, 1978).
Data Envelopment Analysis	A non-parametric efficiency analysis tool (Zhu, 2015).
Decision Marking Unit	Is the process transform unit which turns inputs to outputs (Charnes et al., 1978)

C2 General

Exponential Organisation	An organisation produces returns of at least 10X (Ismail et al., 2014 2014).
Relative Efficiency	The efficiency measure of a unit compared to its peers (Charnes et al., 1978)
Technical Efficiency	Decision unit technical technology measure (Charnes et al., 1978) (Banker et al., 1984 1984).
Variable Returns Scale	Is a DEA model based on increasing or decreasing returns to scale (Zhu, 2015) (Banker et al., 1984 1984).
Slider banner	The header bar on the website page
Productivity/Efficiency	The measure of the output over the input of an organisation

C2 General

1.8 Assumptions

Assume that the input/outputs of a DMU are homogenous, but they might just be diverse because of the resources and geography of the DMU's.

The DMU's may present themselves as homogenous as an assumption, but heterogeneity may present itself.

The farthest point on the envelope graph and part of the frontier is considered the DMU with 100% relative efficiency.

Random input/output selection may promote bias efficiency results.

The more input/output the accurate the efficiency results, this may warrant more computer resource usage.

C2 General

CHAPTER 2. LITERATURE REVIEW

2.1 Background discussion

A digital master is a company that excels in the digital technologies and digital leadership skills, and these digital companies will be 26% more profitable than their average industry peers and at the same time generate 9% more revenue and be more efficient(Westerman et al., 2014). Companies that fail to become a digital masters lack the **digital capabilities** to work differently and **leadership capabilities** required to set a vision and execute on it(Westerman et al., 2014).

According to a survey by MIT, it was established that for companies to improve efficiencies companies need to go digital at the same time aligning for a digital future, though the main objective was not aimed at improving efficiency but rather improving customer experience and engagement(Kiron et al., 2016). The argument is that for companies to be ready digitally, they not only need the **digital enablers** but their **culture, people, structure and tasks** they should be aligned with the company's strategy and the challenges of a continually changing digital landscape(Kiron et al., 2016).

In 1936 Kurt Lewin theorised that behaviour is a function of the person and their environment(Lewin, 1936), Lewin believed group values tend to affect an individual's cognitive structure, modifies their valences and values as well as affects the individual's overt behaviour, and these changes translate to the organisation behaviour. For successful culture reconstruction, Lewin theorised that change in atmosphere, changes in power constellation in groups and change in leadership(Lewin, 1936).

C2 General

Exponential organisation are organisations that are digital master's therefore, they have high digital leadership and skills. They behave differently to their linear peers, mostly due to the culture shift and the utilisation of the digital enablers. According to Salim Ismail, ExO have three sets of groupings MTP, IDEAS and SCALE, which is a combination of behaviour change and digitalisation(Ismail et al., 2014).

The Data Envelopment Analysis is the study of organisation's productivity levels, Unlike TFP(Fried, Lovell, & Schmidt, 1993) which is used to analyse the organisation's productivity from a single point of view. The TFP is the quotient of the sales output, and input labour and DEA makes use of multiple input/output. Advances in DEA by William Cooper(Charnes et al., 1978)(Färe & Zelenyuk, 2015) have made provision for a broader measure which includes a multiple input/output multiple input/output model become ideal in a service-oriented sector like telecommunication sector.

2.2 Introduction

Organisational behaviour is attributed to organisational effectiveness and performance, which is an outcome of good technical and people skills.

For organisations to eventually become successful, the organisation must look at the improvements of the organisational behaviour, which is the influence of three discipline (psychology, sociology and anthropology).

Psychology: this discipline mainly emphasis on the individual within the organisation and the areas of concern include and not limited to the individual's perception, attitude towards life, work, peers and colleagues(Mullins & Christy 2016).

Sociology: Deals with an individual's social structures and their positions in society and how these structures affect the individual's performance in the organisation therefore the overall organisational effectiveness and

C2 General

performance(Mullins & Christy 2016). Sociology plays a key role for new employees as they rely on specific contingent role models within the organisation to learn the culture and structures of the organisation this in turn builds the individuals personal style and role behaviour(Filstad, 2004).

Anthropology: Its group focused and deals with cultural system, individuals' beliefs and customs. This focus is the underpinning foundation of building an inclusive and open work culture in the organisation(Mullins & Christy 2016).

The overlap of these disciplines combined with other relevant principles creates the basis of the well-balanced organisational behaviour along with the nature and purpose of the organisation, these disciplines inclusive of the organisation's purpose are critical influencers of the organisation's behaviour thus determent of the organisational future.

All these are attributed by human behaviour where this human behaviour is presented by four groups **(individuals, groups, organisation and the environment)**. The **individual** form part of the central nervous system of the organisations, therefore, creates the main feature of the organisational behaviour and where the needs of the individual and the demands of the organisation are incompatible this can result in frustration or conflict(Mullins & Christy 2016). The group is the combination of the organisation's individuals these **groups** might be formal or informal groups formed with the **organisation,** and this leads to the development of the organisation which the collectiveness of these groups forms the organisation and develops its own culture and behaviour as a result of the different individual personalities. The external or internal changing **environment** of the organisation affects the organisation's effectiveness, performance and the organisation's behaviour.

These collectively form a basic framework of organisational behaviour which illustrates how and why organisations behave the way they do; this framework is forms the fundamentals of change management.

C2 General

The management of the organisation is ultimately responsible for the behaviour established in an organisation as they control the internal environment of the organisation(Huczynski & Buchanan, 2013). The management is also part of the organisation's individuals/groups but because of their level and role in the organisation they are the custodians of the type of organisational structure to be implemented (**autocratic, custodial, supportive, collegial and system model**).

Regarding exponentiality of an organisation, this paper will be exploring Salim Ismail' book which explains and formulate the exponential organisation and how to future proof an organisation. The book highlights how the use of technology and culture change alters the organisation's behaviour. Salim compared companies as old as 50 years and companies like Google or Amazon, from this he deduced reasons why the newer companies produced exponential returns compared to the older companies. One key difference was digitalisation which includes the culture change within those organisations, and from this Salim characterised the exponential organisation as having MTP, SCALE and IDEAS (Ismail et al., 2014).

MTP, Massive Transformative Purpose which speaks to defining a colossal life-changing purpose one which may seem unattainable or achievable. Religious studies have indicated that humans are created with a driver embedded, and they live their life trying to establish that driver (Warren, 1993). When humans find their purpose they live a fulfilling life with less worry or stress as they are driven by their purpose as their real life's compass(Warren, 1993). A conscious business(Mackey & Sisodia, 2014) is defined by its true north, its higher purpose. These businesses are able to answer why they exist! What drives them, Where they fit in the ecosystem, a conscious business' higher purpose becomes its center of attraction to its investors, customers, third party contractors and its employees(Mackey & Sisodia, 2014). The advantage of a higher purpose in an organisation it is the increased energy levels and every task accomplished with the spirit of servitude(Mackey & Sisodia, 2014). The MTP develops and builds the **culture, leadership style** as well as create the **right environment** conducive

C2 General

to all individuals or groups within the organisation and will become the focal point in determining the organisation's behaviour.

One MTP(Ismail et al., 2014) we can relate to is that of Google “Organise the world's information” (Ismail et al., 2014) this has translated into its passion, the why factor of their business. To address the customer's needs, ExO makes use of a series of methods and these are a combination of staff on demand, community & crowd, algorithms, leverage assets and engagement (SCALE) (Ismail et al., 2014) therefore it promotes creativity, growth and customer engagement.

IDEAS which represents an Interface, Dashboard, Experimentation, Autonomy and Social(Ismail et al., 2014) address the methods to be used to optimise for internal operations resulting in improved operations. According to Salim Ismail, when implemented the result should produce an ExO that either cannibalises itself therefore not grow or become a dominate hunter in its industry, these organisations become very disruptive to their linear peers.

Some studies around business productivity were relating to the Total factor productivity TFP(Fried et al., 1993) which is an average view of a single input and output(Fried et al., 1993) therefore not allowing for multiple input or outputs.

William Cooper's article(Charnes et al., 1978) saw a need to have an efficiency measure that allowed for multiple inputs-outputs and not limiting a productivity measurement to a single input-output average. William Cooper and team proposed that measure of the relative efficiency of any DMU is obtained as the maximum of a ratio of weighted output to weighted inputs subject to the condition that the similar ratios for every DMU be lesser than or equal to unity(Charnes et al., 1978), this was an improvement of the DEA model by Charnes(Charnes et al., 1978). The DEA(Charnes et al., 1978) formula makes clear indication of the efficient frontier which is a gradient between two efficient points this is useful in analysing the trade-off to improve the efficiency of the DMU(Zhu, 2015). Underperforming units use the efficient frontier as a reference to analyse and

C2 General

gauge their own performance, from this an HCU(Zhu, 2015) is established on the efficient frontier gradient, the productivity gap which is the difference between the DMU and HCU(Zhu, 2015).

This chapter reviews the literature on organisational behaviour theory which is applied through ExO methods and how they can improve productivity. Furthermore, this research investigates the theoretical constructs of productivity measure, change management and how culture change impacts the output of the organisation.

This section first observes the characteristics of ExO and outlines the importance of each and eventually highlighting the economic impact of implementation. Furthermore, this section establishes the DEA tool used to calculate the efficiency and highlighting the key performance indicators for this study.

2.3 Outline and implement the characteristics of ExO

Linear organisations usually less digital; in this section we will highlight all essential methods to implement and move an organisation from linearity to exponential. For the purpose of this study, only ExO-lite methods will be implemented.

2.3.1 *Massive Transformative Purpose*

Linear organisations establish their purpose and values, which eventually translate to their vision and strategic goals. With ExO this falls off and an MTP is formulated.

The MTP aims to capture hearts, minds, imaginations and ambitions of those both inside and outside the organisation. Cultural changes through MTP, the MTP aims to inspire and create communities around the ExO and spontaneously

C2 General

begins operating on its own, ultimately creating its own community, tribe and culture(Ismail et al., 2014).

Massive transformative purpose is audaciously big, transformative and inspires therefore meant to leap the organisation into a new frontier. The Kantar Purpose Study demonstrates that companies aligned to a mission or purpose can increase their perceived impact, and consequently, their brand growth(Gibbs, 2020). Research from Alison Alexander found that finding meaning in life was closely related to finding meaning through work(*The Power of Purpose: How Organisations Are Making Work More Meaningful Northwestern University | School of Education & Social Policy*, n.d.). Organisational purpose increases employee engagement, affective commitment, and alignment to organisational values for its employees when they experience a sense of meaningfulness at work(*The Power of Purpose: How Organisations Are Making Work More Meaningful Northwestern University | School of Education & Social Policy*, n.d.).

Purpose of an organisation will have an impact on the type of organisational behaviour, the organisational behaviour defines the attitude, work ethic and culture within the organisation. To remain competitive and reaching strategic objectives, organisations should have a purpose/MTP that provides meaningfulness internally and externally.

2.3.2 *SCALE*

Community and Crowd

Looking from the internal to the external a **community** is inclusive of employee teams, customers and third-party partners/vendors. The **crowd** is individuals with a set of skills and are attracted to the organisation because of an idea, funding opportunity or incentive prize. An organisation will need to create a platform to automate a peer-to-peer engagement(Ismail et al., 2014) as a communication process with the community. All members of both a community and the crowd

C2 General

need to be aligned to the organisations MTP(Ismail et al., 2014) by pursuing a shared vision.

Having strong leadership will nurture and grow these communities and crowds daily, strong leadership afford community sustainability. Creativity and innovation are the center of attraction for the crowds all these combined with the culture of experimentation(Ismail et al., 2014). Workplace learning is a vital subset of the community concept. Evidence shows that collective guidance from the entire work community provided learning and gradual increase in responsibilities for employees(Mikkonen et al., 2017). Organisations need to be wary of creating communities that share a silo type vision but rather a cross-functional vision. Organisational competence requires cross-functional abilities(Forsten-Astikainen et al., 2017).

A community which has a shared vision which is aligned to the organisations MTP/purpose creates a cross-functional learning environment which breeds creativity and innovation. Building communities "Community & Crowd" (Ismail et al., 2014) will lack the required results because of the "low or fundamental digital skills" ("South African CEOs are struggling to find digital skills," 2018) which are required to build external communities. The skills constraint will force Telecoms organisations to look outside of the country in order to develop these communities or the internal skill set required for their business needs.

Algorithms

Algorithms are software code which allows for specific decision-making process typically repetitive function/process to be automated. The algorithms mitigate and compensate for many of the biased heuristics in human cognition(Ismail et al., 2014).

Algorithms are a series of steps and have advanced from a support role to an autonomous system that makes decisions on behalf of humans(Hosanagar, 2019). Algorithms may be biased as they have limited cognitive functionality but with an ability to learn using artificial intelligence. For example, in 2014, the

C2 General

Houston Federation of Teachers brought a lawsuit against the Houston school district, arguing that the district's use of a secret algorithm to determine how teachers were evaluated, fired, and given bonuses was unfair(Walsh, 2019).

Implementing algorithms in environments that do not require cognitive thinking like sick patients or employee dismissal removes the biases from the technology. Canadian TD bank integrated Flybit's algorithm based on artificial intelligence to alert their client of loan expiration and invite to renew as well upselling(Uzialko, 2019).

Data is increasingly becoming a critical competitive advantage differentiator therefore, algorithms need to be an integral part of the organisation.

Engagements

Engagement is a way of enabling collaborative human behaviour and social behaviour to come into play. Engagements should create a network effect and positive feedback loops, encourage co-creation between product owners and customers(Ismail et al., 2014). Engagements should be allowed for transparency, instant feedback with shorter feedback cycles(Ismail et al., 2014).

Customer engagement is described as customer recommendations, referrals, web postings and many other behaviours influencing the organisation and its brands(Harmeling et al., 2017). Co-creation, as another method of engagement, allows the organisation's customers to be part of the decision making of the organisation. Through co-creation customers feel though the organisation is theirs, thus having implications beyond initial task-based initiative, customers who evaluate the organisation are more favourably when they feel a sense of ownership to towards it(Harmeling et al., 2017).

Organisation incentivise its customers as a form of engagement to make the customers buy more(Kumar et al., 2019), reward cards like Woolworths loyalty

C2 General

card or clicks loyalty card, which either provides special discounts or special access to flash sales.

Through engagement, an organisation can grow its brand through collaboration with its customers.

2.3.3 *IDEAS*

Dashboards

Migration from KPI's to OKR's allows the organisation will move from a top-down structure to a bottom-up structure. Because ExO grow at a rapid pace, they require that business instruments, individual and team assessments to be integrated and carried out in realtime monitoring allowing for small mistakes to be noticed before they grow(Ismail et al., 2014).

Effectiveness of dashboards lies in the adaptiveness of the dashboard and through this dashboards can improve collaboration. Dashboard effectiveness experiment was performed on 88 university student for four weeks which enabled students to monitor their learning progress actively, the outcome was positive(Jeongyun Han et al., 2020).

The dashboard provides transparency into a process, but its all dependant on the dashboard design. A partnership between the Brazilian government and Moovit social application had and objective of improving the quality of the transportation and transparency by showing realtime city’s bus system(Matheus et al., 2018).

Dashboards effectiveness is found in the design, its realtime ability and accessibility these provide for a transparent process while improving decision making.

Experimentation

C2 General

We define Experimentation as the implementation of the Lean Startup methodology of testing assumptions and continually experimenting with controlled risks." (Ismail et al., 2014)

Then booking.com CEO Gillian Tans proposed and radical experiment which would see the site layout change completely as audacious she was also sceptical and the head of the experimentation team also not convinced the change will be positive. The experimentation transformed booking.com from a small Dutch start-up to the worlds largest online accommodation(Thomke, 2020).

Leadership change is fundamental in promoting a culture of experimentation, a leader who is role model and is subjected to the same processes as the rest of the employees(Thomke, 2020).

"Experimentation" being some of the critical elements of future growth for a digital company which is generally aligned with the implementation of the agile methodology may be centralised. To decentralise the Experimentation, the financial model needs to be a decentralised model, allowing specific departments to pool their finances and creating autonomy. With the correct leadership style which advocates for experimentation the organisation is inclined to more be innovative and disruptive.

Social Technologies

Social technologies are technologies that allow for information sharing with ease these might include sharing of ideas, thoughts or creating virtual social networks inside communities. Usually, this may be done through the use of internet-based platforms.

As part of Daimler's Business Innovation Community open strategy initiative through social technology, Dialmer had 2000 submissions of ideas identifying new growth areas beyond car manufacturing, after this success Daimler is planning a follow up the initiative(Harrysson et al., 2016).

C2 General

Social technologies unleash creative forces among users and enable new relationships and group dynamics. In the hyperactive world people can feel immediate benefits in connecting with the right peers, getting answers to questions and finding information(Skarzauskiene et al., 2013).

Social technologies play a critical role in flattening the management hierarchies and as part of an inclusive strategy accelerates autonomy within the organisation.

2.3.4 Proposition

The ExO methods will be implemented to a marketing department, the implementation of the ExO methods will require a change in the strategy of the organisation, the change will impact the organisation behaviour and over period should yield positive results but not the desired 10X growth.

2.4 Analyse the ExO impact on productivity

The basic idea of DEA is to apply some output and input values of other parts which attempt to create a hypothetical composite part out of current parts(Soheilirad et al., 2018). To analyse the productivity levels of the organisation, a DEA model will be implemented before and after the implementation of the ExO methods., these DEA models are CCR and the BCC model. Key inputs (customer data, human resource, operational cost and miscellaneous data) along with output (sales, insights, CRM, branding and reputation and internal activities). These are observed KPI's which combined output the productivity of the marketing department or division. The largest driver of productivity for the marketing department is the human resource and operational cost, which are directly linked to sales generated.

C2 General

2.4.1 *DEA*

DEA efficiency ratio:

$$Hj = \frac{\sum_{r=1}^{s} UrYrj}{\sum_{i=1}^{m} ViXij}$$

j = number of DMU

m = number of inputs

s = number of outputs

Yrj , Xij = known output and inputs respectively for the jth DMU

Specific model variables

(Ur,Vi => 0) = variable weight on output and inputs respectively for the jth term

(0 <= Hj <= 1) = efficiency of DMU

Models

CCR = $\sum_{r=1}^{s} UrYrj$

BCC = $\sum_{r=1}^{s} Yrj + \sum_{i=1}^{m} Xij$

Allocative Efficiency = Price Efficiency / TE

Scale Efficiency/ TE = CCR / BCC

C2 General

Price Efficiency = DEA efficiency with the numerator being the minimum total cost obtained for a DMU and the denominator being the actual cost of the sum of the DMU's (Watkins, Hristovska, Mazzanti, & Wilson, 2013).

For optimisation of DMU's Yrj & Xij are constant values recorded from previous operations of the unit/s for both inputs and outputs. However, hypothetical values may be used to build a theoretical model(Charnes et al., 1978). It is important to note that the CCR model is the base model which results in an outcome of "Constant Returns to Scale (CRS)" (Banker et al., 1984).

BCC model which utilises the variable returns to scale (VRS)(Banker et al., 1984) which is used to analyse how the organisation can optimise the output of a given input/s from a given set of DMU/s. BCC was optimised to calculate the technical efficiency (Abel & Bara, 2017; Westerman et al.), the association of the average production cost and the output levels of the DMU. One of the derivatives of technical efficiency is scale efficiency which is the measure of the size of the organisational (Abel & Bara, 2017). BCC model may be considered if the inputs and outputs are constant, then the CCR may be considered to calculate for all discussed efficiencies listed in this study.

Price Efficiency: With the mounting pressure in the South African telecoms sector by the public and the regulator ICASA to reduce data costs(Rifkin, 2014). Economies of scale and current economic trends, e.g. 29% unemployment rate(Omarjee, 2019) are factors that will influence the price efficiency.

Allocative efficiency: Mary Sagaya found through empirical research, that faculty members having high emotional intelligence, can balance both work and family life, and they will not be not productive at the workplace for more hours and they can spend maximum hours with family members which proves the more significant impact of emotional intelligence on work-life balance(Vasumathi et al., 2019). The ExO methods which address resource allocation(allocative efficiency) is "Staff on demand, Assets and Community/Crowd" (Ismail et al., 2014).

C2 General

Technical & Scale efficiency: research by Sahin through predictive modelling found that technology had a positive impact on overall business performance(ŞAHİN & TOPAL, 2018). A South Korean tyre company Kumho decided to overhaul their then-current tire production line to be able to integrate radio frequency identity tagging of the tyres. The adoption of the new technology led to Kumho becoming the first tyre organisation worldwide to be able to track and trace their tyres by scanning the tyres(Junghee Han & Park, 2017). The technical efficiency which is proportional to the operations of the DMU and indirectly related to the customer experience, which has become a key area of concern for most executives.

Implementing "Algorithms, Dashboards, Experimentations, Engagements and Social technologies" (Ismail et al., 2014) addresses the technical efficiency. The scale efficiency, which is the measure of the production output versus the size of the unit/organisation which can be closely related to the number of products or services offered to the customer. Scale efficiency relates to "Engagement" (Ismail et al., 2014).

2.4.2 *Hypothesis*

Through the implementation of the ExO methods, the study looks to apply DEA to analyse the productive efficiency improvement. The improvement of 10X is expected on all efficiency measures.

Relative efficiency: DEA is a benchmarking efficiency model, and through the implementation of a new strategy, it is expected that the relative efficiency of the DMU's will improve by 10X.

Price Efficiency: Evidence has led this study to make a hypothesis that price efficiency will not improve when the ExO methods are applied. Therefore the efficiency is not expected to improve by 10X.

C2 General

Allocative efficiency: Will experience improvements and if implemented fully on all affected DMU's an x10 or more improvement is projected. However, inefficiencies may raise from the reallocation of human resources as their level of emotional intelligence is not taken into consideration.

Technical & Scale efficiency: The technical efficiency will increase with the introduction of new technology and proportionally improve scale efficiency.

2.5 Conclusion of the Literature Review

In conclusion, implementation of the ExO methods within an organisation will have a positive impact on organisational behaviour. The organisational behaviour is centered around people and the culture they develop within an organisation, and that culture becomes the DNA of the organisation and the core of its competitive edge. Through a change management process, the ExO methods will yield positive results but not the publicly highlighted 10X productivity. Strategy change is critical in realising the benefits of ExO however, macro factors need to be considered. Given the current economic conditions in South Africa price efficiency will not have a desirable outcome compared to allocative efficiency. Technology, as one of the enablers of ExO affirms the positive outcome of technical and scale efficiency.

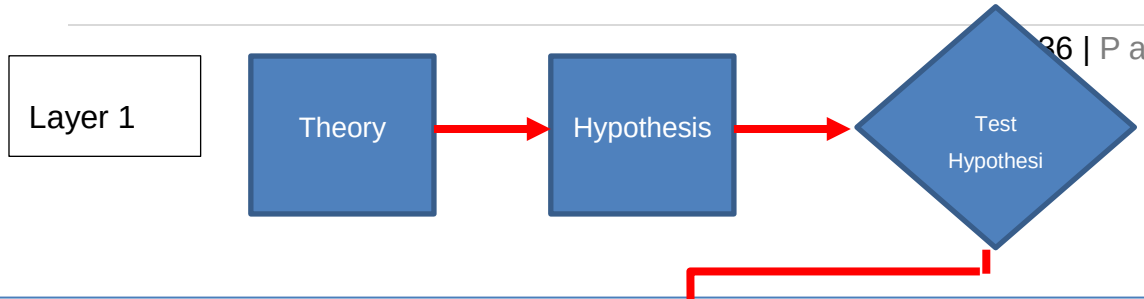
C2 General

CHAPTER 3. RESEARCH METHODOLOGY

3.1 Research approach

This study is quantitative experimental research which aims at implementing ExO(Ismail et al., 2014) methods to a perceived linear telecoms organisation and analyses the impact these methods have on productivity. The main focus of the study is on the productivity measure of technology, consumer and enterprise facing business units as well as the internal operations.

The data envelopment analysis will be used to analyse the "relative, price, scale, technical and allocative efficiency" (Zhu, 2015) of the fore mentioned linear organisational structure and ExO(Ismail et al., 2014) structure which will highlight the productivity improvements.



C2 General

The research approach is from the field of quantitative theory, thus its a deductive approach(Creswell, 2014). The first layer discusses the theory of the ExO, Digital transformation and DEA, the theoretical framework delve deep into the origins of ExO, Digital transformation and DEA at the same time making subtle comparisons between the ExO and digitally transformed company. Because of

C2 General

how the products and services of a telecom's organisation are sold or marketed, the DEA becomes essential in evaluating the efficiency of their input and outputs. From the discussed theory, the study formulated a hypothesis of how efficiency will improve or not when the ExO methods are applied to a linear organisation.

The second layer is the ExO implementation, data collection and efficiency analysis of the different DMU's. In a bid to test the hypothesis, the study will collect the existing input data of the identified DMU's and apply the DEA to analyse the productivity of the DMU's. ExO methods will be applied to the observed DMU's and the input/output data will be collected and DEA will be applied to analyse the productivity of the units. Both the current efficiency and the ExO efficiency will be benchmarked against each to analyse for any improvements or not.

The last layer which is layer three will be the concluding statement which confirms or disprove the hypothesis and proposition of the study, and the conclusion will be led by the benchmarking made between the current and ExO productivity levels.

C2 General

3.2 Experimental Research Design

The research design chosen for this study is the true experimental research design which will allow the study to discover the causal relationship of ExO and productivity in a telecommunication organisation.

Implementing the ExO methods, this will compose of experimental groups which are semi-randomly selected and the selection will be based on the ExO mini-survey. The survey will determine if the group is on the verge of been disrupted or is it already implementing ExO methods.

The analyses of the productivity which is the main focus of the research will make use of DEA which is a quantitative formula to calculate the productivity of a DMU. The DEA method is non-parametric in nature and was designed to analyse the productivity level of one DMU against its peers, these DMU's and peers could be any type of organisation or a business unit. The initial analysis will yield an efficiency frontier which is a result of the DMU's been analysed and DMU's are not restricted to having one input/output.

The inputs into this process consist of and not limited to resources which are the human resources, technical/IT resources and the customer's data. The customer's data may be affected by the customer's feedback as negative feedback my signal product/services return therefore altering the output. Miscellaneous data is all other data needed by the DMU to continue operations these may include and not limited to the unplanned external events and weather conditions. The operational cost (OPEX) is all the production costs of the final product /services. In the world of abundance and zero marginal cost organisations are seeking to improve on the value they generate for their customers therefore, more outputs from organisations. Customer value creation by increasing the outputs will create an imbalanced seesaw resulting in unsustainable long term value creation. Creating more value for the customers, organisations may seek to reduce their inputs thus the DEA model applied in this study is input/output-oriented meaning for organisations to improve the DMU

C2 General

productivity they will need to reduce their inputs(independent variables) or improve their output.

The independent variables feed into the intervening variable (DMU) these DMU's would be any business unit within the organisation and for the purpose of this study the consumer business unit, enterprise business unit and technology unit will be considered the possible DMU's. These units are customer-facing and have operations at the edge of the organisational structure. The DEA models are to be applied to the intervening variables to produce the productivity levels of the different units relying on the independent variable. The DEA models considered for this study is the CCR and the BCC as they have different input requirement, with CCR seeking constant variable and the improved version of CCR the BCC to be able to handle varying inputs. The CCR is not able to cater to negative inputs with BCC designed to cater for negative and positive inputs.

The dependent variables which are the output are the result of the independent and intervening variable and the output may provide insights, CRM with critical stakeholders, branding and reputation and internal activities. These outputs for the telecommunication organisation are not limited to the above mentioned and can be extended if and when required.

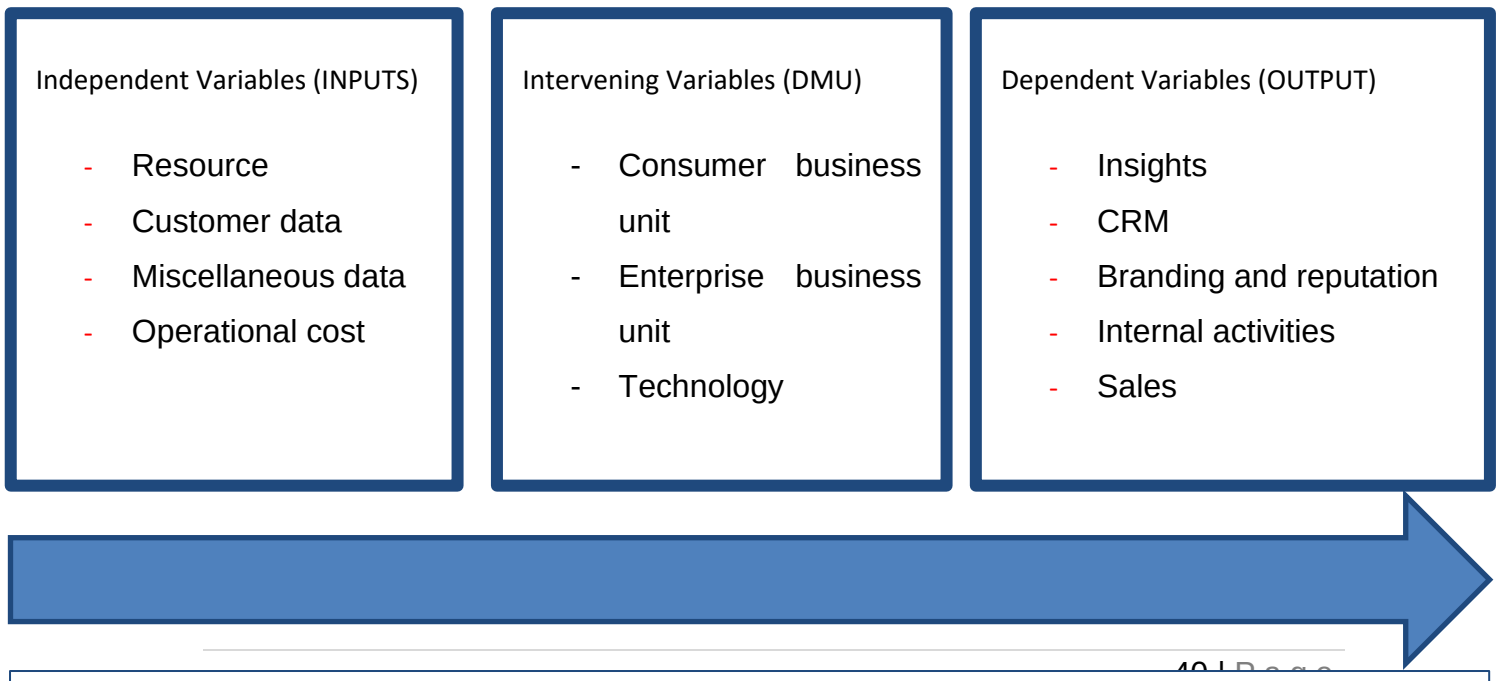


Figure 3 : Design structure

Table 1: Design advantages and disadvantages

Advantage	Disadvantage
Ability to analyse both the input and output of a unit	Not indicative of how to improve the productivity
Multiple inputs and output consideration	Its complex nature makes it challenging to have a mix-oriented approach

3.3 Data collection methods

The observation method of collecting data will be used in terms of gathering information about the exponential quotient of the different units. The practical information will be secondary data and will be solely used to define the characteristic of specific DMU in terms of the ExO methods. The DMU's are on the edges of the company structure in which they are the remote organisational office's which encompasses all customer-facing business units.

For the analysis of the productivity of the different DMU using DEA, the data will be sourced from publishable organisational data source as the organisation is publicly listed. The collected information will be sourced from the organisation's internal financial and economic databases along with their published annual integrated reports, these data will be used as input and output in the DEA model. Because of the rapid rate of growth in the telecommunication sector, this study targets quarterly data.

C2 General

3.4 Population and sample

3.4.1 *Population*

The population for this study is both internal and external population of the organisation which is more dictated by the DEA model requiring the input and output data. The size of the internal population also refered to as input for a DMU is determined by Human resources, Product/service-related data set, OPEX and IT resources.

The external population also referred to as output is the customers served by these DMU's and because of their varying nature and for sampling purpose the outputs will be in clusters which consist of Insights, CRM with critical stakeholders, sales, branding, reputation and internal activities.

Because of the sensitivity of certain organisational information, clustering/multistage will be required.

3.4.2 *Sample and sampling method*

The sampling method will follow the structure of the DEA model with the input/output data collected through observation and from the internal databases as well as annual integrated reports. The number of DMU's permitted by the organisation is two for the purpose of business continuity and having less operational disruptions.

The sampling method will be random but in a controlled environment, this environment is the **region between linearity and exponential** as illustrated in the ExO book, this region indicates if or whether the DMU is going to be disrupted by the new digital technologies.

C2 General

3.5 The research instruments

3.5.1 *Productivity instrument*

$$Hj = \frac{\sum_{r=1}^{s} UrYrj}{\sum_{i=1}^{m} ViXij}$$

To elaborate on the above formula let us assume the below, where the different DMU's are the different units to be measured.

Table 2: Research Instrument DEA (Input/Outputs)

			INPUTS			OUTPUTS		
	Human resource	Data set	Opex	IT resource	Insights	CRM	Internal	Branding and reputation
DMU1	2	10	R30000	1	3	3	0	1
DMU2	1	5	R15000	1	1	6	0	1
DMU3	1	12	R100	1	3	1	0	1

C2 General

Before we apply the formula we need to normalise all the inputs/output of the different DMU is the normalisation will scale all value should be 0 =< value <= 1.

$$Nij = \frac{Xij}{\sqrt{\sum_{j=1}^{n} Xij\text{^}2}}$$

Where Nij = is the new normalised value to the i-th term and DMU to the j-th term.

Xij = is the observed input/output to the i-th term for the value and j-th term for the DMU.

When applied first calculate the common denominator for each input/output set then get the quotient of each input/output per DMU using the common dominator.

Table 3: Research instrument normalised Input/Outputs

	INPUTS				OUTPUTS			
	Human resource	Data set	Opex	IT-resource	Insights	CRM	Internal	Branding &reputation
DMU1	0,816	0,609	0,894	0,577	0,688	0,442	0	0,577
DMU2	0,408	0,304	0,447	0,577	0,229	0,884	0	0,577
DMU3	0,408	0,731	0,002	0,577	0,688	0,147	0	0,577
Denominator	2,449	16,401	33541,168	1,732	4,358	6,782	0	1,732

As applied, the above values are observed, from this we can apply one of the mention DEA models in this paper.

The CCR DEA model:

C2 General

$$Hj = {}^{1}/_{gj}$$

Where:

$$gj = \min(\sum_{i=1}^{m} ViXij)$$

Subject to:

$$-\sum_{r=1}^{s} UrYrj + \sum_{i=1}^{m} ViXij \geq 0 \qquad for\ j = 1, \dots\dots\dots\dots\dots$$

$$\sum_{r=1}^{s} UrYrj = 1$$

$$Ur \geq 0, r = 1 \dots . s$$

$$Vi \geq 0, i = 1 \dots . . m$$

Where j is the number of DMU's, m is the number of inputs and s is the number outputs.

Xij and Yij denote the values of i-th input and r-th output for the j-th DMU.

Ur and Vi denote the weights of the output and input respectively which are calculated by solving the linear programming problem, they are non-negatives.

Where the objective function for each DMU :

C2 General

g1= min (0,688V1+0,442V2+0V3+0,577V4)

Equality constraint:

0,816U1+0,609U2+0,894U3+0,577U4=1

g2= min (0,229V1+0,884V2+0V3+0,577V4)

Equality constraint:

0,408U1+0,304U2+0,447U3+0,577U4 = 1

g3= min (0,688V1+0,147V2+0V3+0,577V4)

Equality constraint:

0,408U1+0,731U2+0,002U3+0,577U4 = 1

Note because this is input oriented therefore as per LP all unrelated values should be in unity thus the sum of the output values for a calculated DMU should be equal one.

Each objective function is subject to the below convex:

-0,816U1-0,609U2-0,894U3-0,577U4+0,688V1+0,442V2+0V3+0,577V4 => 0

-0,408U1-0,304U2-0,447U3-0,577U4+0,229V1+0,884V2+0V3+0,577V4 => 0

-0,408U1-0,731U2-0,002U3-0,577U4+0,688V1+0,147V2+0V3+0,577V4 => 0

U1, U2, U3, U4, V1, V2, V3, V4 => 0

The rest of the calculation the study will apply the linprog function on MATLAB.

3.5.2 *ExO implementation*

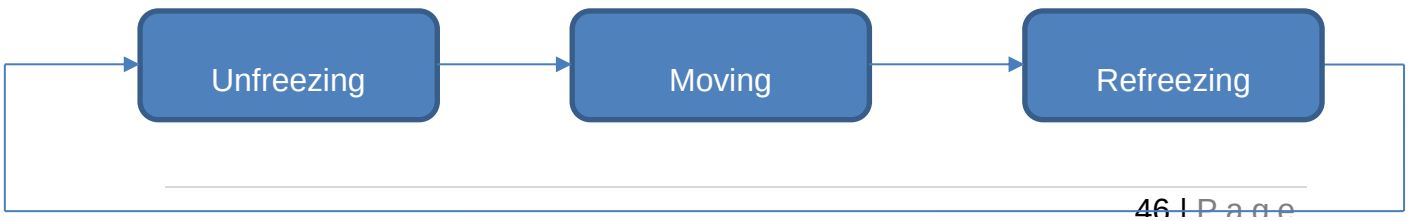


Figure 4 : Kurt Lewin Change model

C2 General

Once the DMU that needs to be improved is identified the next step is to implement the ExO methods and in doing so the study will apply the Kurt Lewin taxonomy of change.

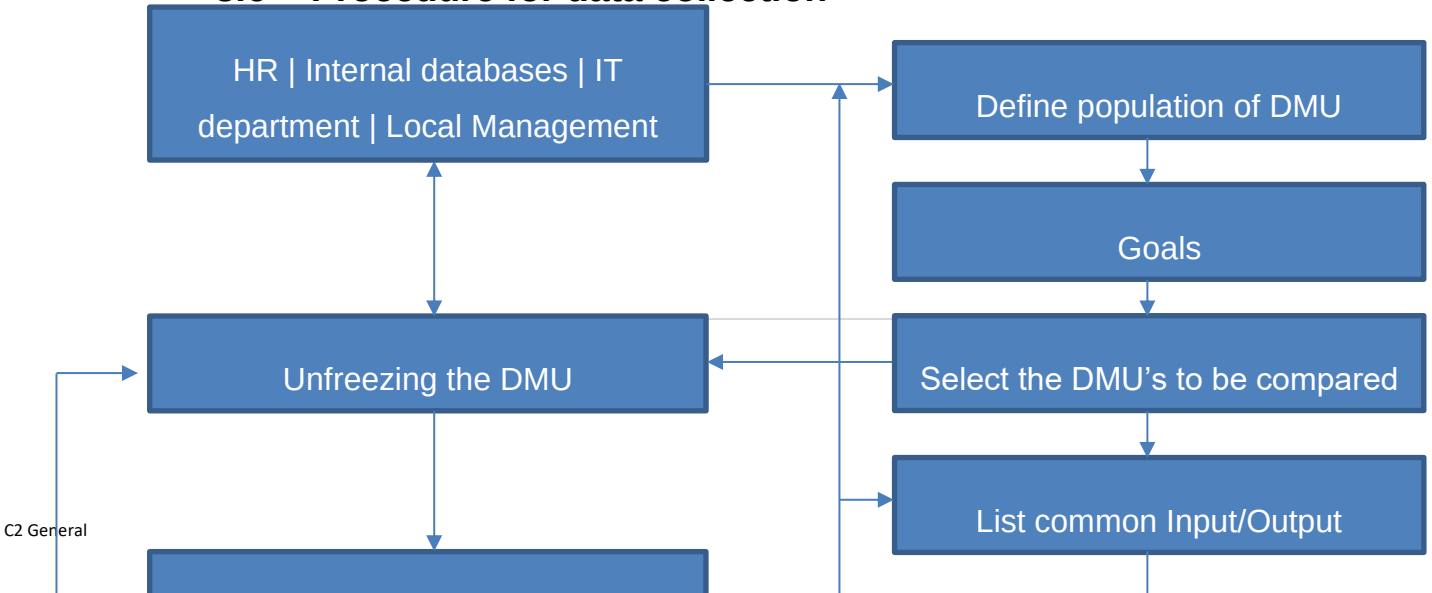
The first process is the unfreezing process which is the process of creating awareness amongst the stakeholders involved in the specific DMU which was identified as needing productivity improvement(Hussain et al., 2018). The stakeholders need to be sensitised of the need for change and highlight all the benefits of the change at the same time find ways to curb the potential resistance to the change, proceeding with the change means that majority of the stakeholders understand and are conscious of the fore coming change.

The second phase is the moving stage which is the implementation of the ExO into the specific DMU, this will introduce new norms and culture for the DMU. Small milestones are encouraged and celebrated to motivate the DMU and excite them for the final completion of the change. Key driver for the implementation is the people leaders who are at all-times equipped with coaching techniques(Hussain et al., 2018).

The final stage is the unfreezing stage where sustainability is built into the implementation this is done through reinforcing the change. In this phase always highlight the key improvements to all stakeholders and what betterment it has brought into the work environment(Hussain et al., 2018). The last part is the monitoring and feedback loop, the monitoring is done to highlight the critical areas of improvement and areas which are struggling to improve or adhere to the change. The feedback loop is feeding back performance statistics to the unfreezing phase therefore feeding it back to the change system as an improvement mechanism.

C2 General

3.6 Procedure for data collection



C2 General

The initial information will be sourced from the HR, Internal databases, IT department and the local management. This information is for the purpose of defining the population of the DMU and also the constraints of the Unfreezing phase. The above diagram illustrates the point of, the flow chart is derived from the DEA application procedure by(Golany & Roll, 1989).

3.7 Data analysis and interpretation

This study is based on the analysis of the productivity of applied ExO methods in which the data envelopment analysis has been chosen and elaborated on in the literature. The DEA model was chosen for its ability to calculate the efficiency of a business unit with multiple inputs and outputs with reduced noise.

3.8 Limitations of the study

i. Because of its ability to calculate multiple input/output and the use of fractional linear programming DEA becomes computationally intensive as the number of DMU's and input/outputs increase. This may create study limitation as it may require advanced computers systems with faster processing power.
ii. DEA is non-parametric therefore statistical studies become challenging to test and prove.

iii. DEA outputs relative efficiency which means it rates a unit to its peers with the same inputs/outputs but it is not able

C2 General

to calculate its absolute efficiency therefore if the DEA model highlights a specific DMU as having an efficiency of 100% does not mean that is the maximum efficiency that particular business unit is able to reach instead it means compared to peers it is producing the highest efficiency. This makes it challenging to suggest efficiency improvement for the best performing DMU.

iv. The period of implementation of this study

C2 General

3.9 Validity

3.9.1 *External validity*

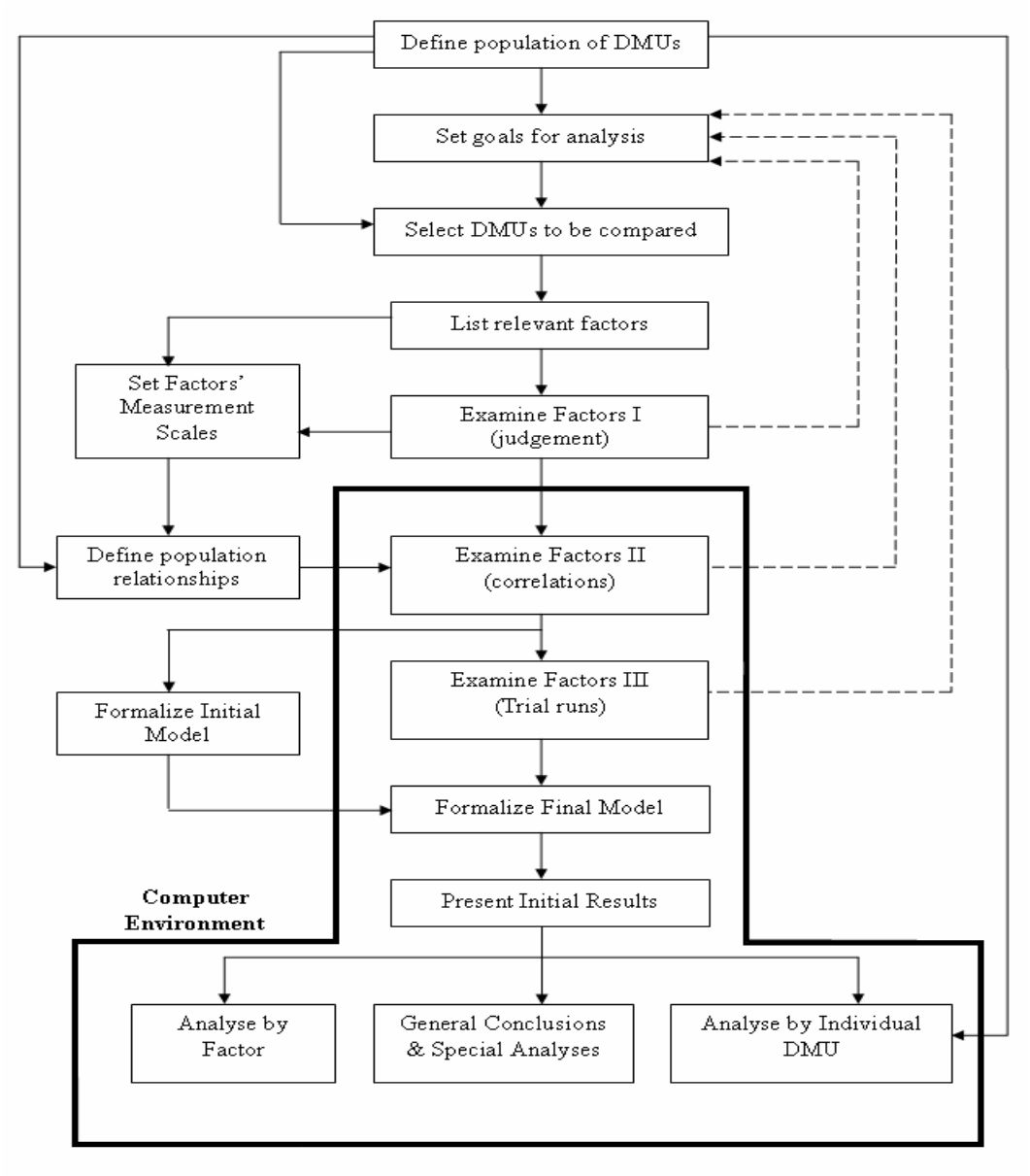


Figure 6: Golany and Roll DEA Validity Procedure

The DEA application flow chart is the external validation flow by (Golany & Roll, 1989) where this validates the population, the implementation and model calibration.

C2 General

This validation includes three key phases which are a selection of the appropriate number of DMU's, rule of thumb, heuristic, physical organisational boundaries and the time horizon of the application. The procedure is intentionally iterative to filter out any incorrect selection of input/outputs when formulating the model(Golany & Roll, 1989).

3.9.2 *Internal validity*

Validating the DEA models efficiency value will be implemented through the usage of the principal component analysis and Spearman correlation(Vásquez-Correa & Rodas, 2019) technique, though this technique may be used as both to verify as well validate.

This will be done through analysing the correlating coefficient of the final DEA results by maximising the variance of a linear combination of a set of independent variable considered. This implementation will be done through a statistical computer program SPSS.

3.9.3 *Reliability*

$$\alpha = \frac{N \cdot \bar{r}}{1 + (N - 1) \cdot \bar{r}}$$

For the reliability, the study will apply the Cronbach Alpha which will evaluate the reliability of the input /output data which feeds into the DMU's, where the closer the coefficient result is to 1 the higher the internal consistency(2019). This scaling formula will be implemented using a statistic program SPSS.

3.10 Demographic profile of respondents

The demographic of this report is limited to the employee input into the DMU as a function of resource allocation (Human Resource).

C2 General

Table 4: Demographic profile

Sex	Age	Count
Male	23-45	6
Female	23-45	9

Level of Education: In terms of digital education,the digital literacy varies vary due to the age gap within this cluster of individuals. Digital education is still needed.

C2 General

CHAPTER 4. PRESENTATION AND DISCUSSION OF RESULTS

4.1 Introduction

Based on the data collected from the two DMU's with 700 transactions combined and the ExO methods where implemented, the results will be presented showing the efficiency of 8 DMU's where two of the DMU's are the impacted DMU's. The efficiency is calculated using the DEA models and data collection which dates from 2019 to 2020, but the months of interest is October – January of those respective years.

4.2 Results pertaining to proposition

The proposition was to rollout the ExO lite in the marketing department, this ExO lite consists of implementing MTP, Community& Crowd, Algorithms, Engagement, Dashboards, Experimentation and Social Technologies. However, due to the limitations of this study, only MTP and Dashboards were implemented.

4.2.1 *Feedback from the MTP*

i. **Unfreezing**

Firstly both DMU-3 and DMU-4 were asked if they knew the purpose of their organisation or rather the organisation they were selling and promoting the products for, and it turned out that both the DMU's lacked knowledge about the purpose of their organisation.

C2 General

Each consultant including their managers was tasked to come up with a purpose as to why "they wake-up every morning and head to the store" and all gave the same general answer:

1. “To make money and provide for my family.”
2. “To better my life.”

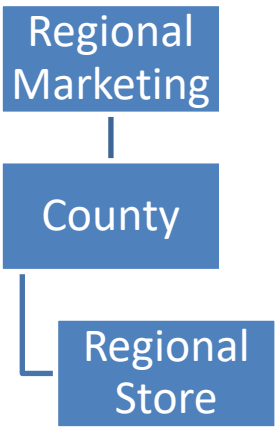


Figure 7: Stakeholder structure

The above figure illustrates the reporting structure of the regional stores (DMU's). Starting from the DMU, the DMU has its own manager who reports to the county (sectional part of a province) field specialist who also has a line manager. The regional marketing has an obligation to the county to provide insights and sales figures about a counties performance over a certain period.

All stakeholders starting from the regional marketing were sensitised about this change, where it will be implemented and on which of the edges of the organisation. Because of the alignment issues with the DMU's and their organisation's purpose we came up with an MTP for both stores which was "**every customer is stepping stone to my better tomorrow**". This MTP was both in line with the organisation's purpose as well as their general purpose.

C2 General

ii. Freezing

In this phase all DMU's where encouraged to practise and live by the MTP "**every customer is a stepping stone to my better tomorrow**" and were constantly reminded of what this meant. The MTP was established with initial feedback from both stores as well as the purpose of the organisation therefore driving the same common purpose(Loozen, 2019).

iii. Refreezing

The last part of this was to monitor and look for any area of improvement in the implementation, because of the nature of this thesis, performance was measured through their sales results.

Table 5: Sales results (units sold) for different DMU's

Month	DMU-1	DMU-2	**DMU-3**	**DMU-4**	DMU-5	DMU-6	DMU-7	DMU-8
Oct-Nov	256	219	**635**	**710**	382	475	361	310
Dec-Jan	376	233	**831**	**829**	438	597	508	448

In conclusion, the DMU's have not fully immersed themselves into this idea which is an idea of a culture change. The DMU's still showed signs of a typical salesperson. The results presented in table 6 show an improvement which is higher than their target or expected growth during this period.

C2 General

4.2.2 *Feedback from Dashboards*

i. Unfreezing

The DMU's already had static dashboards which were handwritten on a whiteboard. The issue with these boards was that only the DMU was able to see these boards and every week the board gets cleared to make space for the new week, this created an issue in getting realtime stats and been competitive with the other DMU's. During this phase the DMU's were re-educated about the purpose of the Dashboard and how to measure the effectiveness of the dashboards.

ii. Freezing

Because the website was planned to be more than a dashboard site, the Dashboard was implemented in phases. The first phase was only depicting the DMU sales performance on three products along with which DMU and consultant were leading, this was done with lessons learned from the implementation of the previous method the MTP. To avoid the consultants from being overwhelmed, the dashboard phasing period was not tracked and had fewer products/services. The uptake was slow and met with resistance as expected. Newer products were regularly added and other features got introduced, these features include the ability to see the best performing consultant along with the worst performing (since inception)amongst the two DMU's and a slider banner indicating the best performing consultant of the week. Random visits were made to clarify specific issues they experienced.

C2 General

iii. Refreezing

The monitoring was done daily through logging into the dashboard site as seen on figure 8 and monitoring to see how many transactions took place, daily database damp was analysed and random site functionality test was performed. Feedback was given to the DMU's manager with suggested improvement measures if needed.



Figure 8: Look and Feel of the Dashboard

C2 General

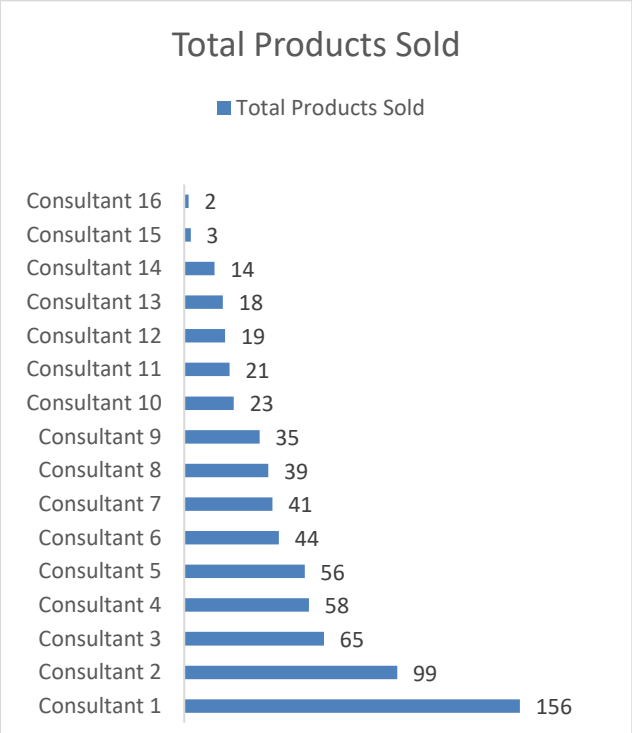


Figure 9 : Dashboard transactions per consultant

DMU	Total Products Sold	Rate of Change
Week 1		
DMU-3	39	0%
DMU-4	44	0%
WEEK 2		
DMU-3	40	3%
DMU-4	3	-93%
WEEK 3		
DMU-3	45	13%
WEEK 4		
DMU-3	68	51%
DMU-4	28	100%
WEEK 5		
DMU-3	65	-4%
DMU-4	202	621%
WEEK 6		
DMU-3	41	-37%
DMU-4	98	-51%
WEEK 7		
DMU-3	22	-46%

Table 6: Weekly transaction

Analysing the feedback from the dashboard transaction and applying Cronbach alpha the transactions yielded an **alpha of 0,78** which indicates an acceptable consistency of the results(UCLA, 2019).

As seen in table 7, DMU-3 has shown consistent weekly transactions with consultant one leading both DMU's in terms of the transaction during the observed period.

The results of DMU-3 are in line with the change management principles. Consultant one was then the acting manager of DMU-3 and was more involved in the trial having inputs on the look and feel of the dashboard site. Consultant one eventually became a change agent for the DMU. Though DMU-3 was going through structural changes as their manager had resigned and they were not so convinced with the appointed consultant as the acting manager, they have

C2 General

participated in the trial on a weekly basis with fewer group sessions and management intervention.

DMU-4 started on the same note as DMU-3 but slowly reduced their transactions which was not because of the reduction in sales but more of the DMU being less motivated to continue. Morning group session was held to drive involvement along with random in-store visits. However, the most significant result came in when management got involved which is line with the freezing stage in the change management model(Hussain et al., 2018). In conclusion, the Dashboard was initially negatively received by both the DMU's but after requesting the line manager and field service consultants to lead the change, the acceptance was overwhelming.

4.3 Results pertaining to hypothesis

Table 7: 2018-2020 DMU efficiency results

	2018				2019/2020			
	Input-Oriented		Output-Oriented		Input-Oriented		Output-Oriented	
	Oct-Nov	Dec-Jan	Oct-Nov	Dec-Jan	Oct-Nov	Dec-Jan	Oct-Nov	Dec-Jan
DMU	Efficiency	Efficiency	Efficiency	Efficiency	Efficiency	Efficiency	Efficiency	Efficiency
DMU1	100%	100%	49%	50%	100%	100%	67%	86%
DMU2	57%	57%	36%	29%	57%	57%	33%	28%
DMU3	**67%**	**67%**	**83%**	**66%**	**100%**	**100%**	**100%**	**100%**
DMU4	**44%**	**44%**	**66%**	**66%**	**100%**	**67%**	**100%**	**100%**
DMU5	100%	100%	100%	100%	100%	100%	100%	100%
DMU6	80%	80%	97%	95%	95%	96%	93%	94%
DMU7	33%	33%	82%	57%	33%	36%	51%	61%
DMU8	50%	50%	40%	34%	50%	51%	45%	54%

This hypothesis is in relation to the proposition, and it was implemented based on the results of the proposition. The information was collected and analysed during the refreezing period of the proposition using the MATLAB DEA code as

C2 General

seen in appendix A and verified the answers using a commercial based program DEAOS.

The results presented are structured as October – November and December-January of which the variable return to scale (VRS)(Banker et al., 1984) redial model(Zhu, 2015) is applied for both input or output orientation.

Table-8 represent efficiency results of 2018-2020 for all analysed DMU's performance and analysing the impacted **DMU-3 and DMU-4** it evident that both the DMU's had not reached 100% efficiency during the observed periods in fact their efficiency ranged from 44%-83% at most.

The impacted DMU's which are **DMU-3 and DMU-4** are compared to six more DMU peers during the same period and these are considered their peers in different geographical areas but have the same financial performance. Two inputs were applied, input one is the number of consultants and the second input is the minimum financial cost per consultant (R3500 x number of consultants).

Before presenting the different results it should be noted that **DMU-3** for the period of Oct-Nov for the year 2019 had a sales target of 669 units while for the period of Dec-Jan 19/2020 the DMU had a target of 667 units, applying a seasonal forecast on the sales **DMU-3** was predicted to produce 659 units for Oct-Nov and 729 units for Dec-Jan.

On the other hand, **DMU-4** for the period of Oct-Nov 2019 was given a lower target of 599 units and for Dec-Jan 19/2020 it was given an even lower target of 596 units though the prediction estimated that **DMU-4** was expected to sell 739

C2 General

units for the period of Oct-Nov 2019 and 792 units for the Dec-Jan 19/2020 period.

Table 8: Monthly Y-O-Y Output growth 2018 - 2020

	DMU-3	DMU-4
Oct-Nov	290%	442%
Dec-Jan	309%	308%

Table 9 is the monthly year on year output growth for the two affected DMU-3 and DMU-4 , it is visible that growth was experienced by the two units but none have achieved the 10x fold increase.

4.4 Summary of the results

The overall results indicate that input-oriented models on average have higher efficiency results, meaning that the DMU's preferring to optimise their inputs have a higher probability of being highly productive. Unlike the output-oriented models where the output needs to be optimised, the efficiency rate overall reduces. Of the impacted DMU's, **DMU-3** showed a consistent trend of scoring 100% efficiency across all models in different observed periods and zero slacks for both its output and input-oriented models, these are aligned with the participation level during the implementation period which is the freezing period(Hussain et al., 2018).Some of the reasons behind the elevated efficiency for **DMU-3** was the involvement of the consultant in the look and feel of the dashboard site and the consultant being the ambassadors of the change.

C2 General

CHAPTER 5. CONCLUSIONS & RECOMMENDATIONS

5.1 Introduction

The final chapter of this study will give a comprehensive conclusion with the recommendation for any further study into this field of Exponential Organisation. The closure will be concluding on the objectives prescribed in this paper which are:

i) Outline and implement the characteristics of ExO lite(Ismail et al., 2014)
ii) Analyse the ExO(Ismail et al., 2014) impact on productivity.

5.2 Conclusions regarding research objective 1

The first objective of this study was to implement the exponential organisation lite methods which they are seven out of eleven methods, these lite methods are concentrated at transforming the internal operations more than the external operations of an organisation. From the seven methods implied for the ExO lite the study only managed to implement two of the methods as stated in the delimitations .

The methods were applied using the Kurt Lewin change management model, during the first stage which is the unfreezing stage all points relating to establishing an MTP were satisfied and the creteria was for the MTP to be ambitious, heartfelt, culture transformative therefore in terms of outlining and implementing these methods, the study met the requirements.

C2 General

The last applied method was Dashboards, it too was implemented using the Kurt Lewin change model, this dashboard website satisfied "the migration of the DMU's KPI's, it was in realtime and showed the organisation, team and individual performance data".

The most significant improvement from the implementation of the Dashboard came from the reduction of manual weekly reports which are submitted by the management of the DMU's to the Field specialist of whom the DMU's report to, these reports are also transferred to the regional marketing team for them to measure if their insights motivated growth in sales.

The two methods were implemented successfully, but the usage was not consistent though constant reminders of the reasons for the change were applied as part of the change model, the participation from the consultants was mostly low as they reacted to escalations more and this behaviour was anticipated.

Because there is not a scientifically defined period for change to be in full effect each case is treated uniquely, the change model was instrumental in the implementation of the ExO and it helped highlight the shortcomings of the rollout. As suggested by Salim Ismail of the book Exponential Organisations the implementation of these methods should be on the edges of the organisation in which the DMU's are but the theory does not highlight the industry.

The DMU's in discussion are the first visible point of presence for the telecommunication organisation, and this environment is mainly localised marketing, sales and commission oriented. The culture was hostile to change more so if the change does not have an immediate impact on their sales numbers, also the reporting structure of the DMU's is that of a franchise of which the sales targets come from the telecommunication organisation while the consultant's report directly to the franchise owner with a dotted line to the field specialist who is employed by the telecommunication organisation.

C2 General

The complexities of the reporting were overcome by the involving the third party's management into the change programme taking place where the management intervened when consultants were not applying the provided tools for the change.

In conclusion, the first objective was implemented successfully but not fully due to the allocated research period. Shortcomings of the ExO lite theory is, it does not prescribe the period it should take or the sequence in which the methods should be applied therefore discretion was applied and Kurt Lewin, change management model, was enforced.

5.3 Conclusions regarding research objective 2

The second objective was directly based on the implementation of the first objective and making use of the DEA instrument to calculate the productivity improvements or lack of, from the two proposed methods it was established that only one was necessary given the environment of the input and output variables in which they are not always constant.

While the South African economic status plays a significant role in consumer spending it was not factored into the calculation of the efficiency.

Concluding this hypothesis the ExO lite if implemented it was theorised to yield at least 10X growth. Contrasting the 2019 and the 2018 efficiencies, **DMU-3** for the period of Oct-Nov the output increased by 290% which is ±3X while **DMU-4** during the same period increased by 442% which is ±5X. Whereas during Dec-Jan **DMU-3** increased its output by 309% and **DMU-4** by 308% which 3X for each DMU.

Though the results are promising the study cannot be concluded as only two methods of the ExO lite where applied.

C2 General

5.4 Recommendations

Based on the results of the implemented ExO methods, it is recommended that a longer period should be afforded to the study. The technology implemented was fairly simple therefore, digital literacy was not an issue but rather culture change.

In effecting culture change it is critical to have a well-defined change management process where it allows the organisation in nurturing their staff and involving them in the forthcoming change, this will allow the staff members to become ambassadors of the change and lead the change.

ExO methods should be implemented through a change management model, using change models reduces any productivity interruptions and allows for business continuity. Along with using the change management model , ExO methods must be implemented in phases instead of all at once.

5.5 Suggestions for further research

To further improvement of DEA efficiency calculation, a method of peer appraisal or cross-efficiency should be reviewed, this will allow DMU to be able to self-rate and rate its peers and benchmark itself based on that feedback.

More study is required for the implementation of ExO methods in the field of marketing and sales. Extensive study is required in determining a realistic growth rate for the exponential organisation regardless of the KPI measure or the observed industry.

The current ExO methods are based on American&European organisations, the African market behaviours different to the American and European markets therefore the current ExO approach needs to be reviewed to satisfy the African market.

C2 General

References

Abel, S., & Bara, A. (Producer). (2017, September). Decomposition of the technical efficiency : Pure Technical and Scale Efficiency of the Financial System. *Econrsa*. Retrieved from https://econrsa.org/publications/research-briefs/decomposition-technical-efficiency-pure-technical-and-scale-efficiency

Banker, R. D., Charnes, A., & Cooper, W. W. (1984). *Some Models for estimating technical and scale inefficiencies in data envelopment analysis*. Retrieved from Pittsburgh , Pennsylvania:

Batuo, M. E. (2015). The role of telecommunications infrastructure in the regional economic growth of Africa. *The Journal of Developing Areas*, p313–330.

Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the effiency of decision making units. *European Journal of Operational Research 2*, 429-444.

Vásquez-Correa, M. C., & Rodas, H. L. (2019). A robust approach for principal component analyisis. *ArXiv Preprint ArXiv:1903.00093*. Creswell, J. W. (2014). *Research design Qualitative , Quantitative and mixed methods approach 4th Ed*. New Delhi: Sage Publications India Pvt.LTD.

DEA Solver Light. (2003, November 18). *MathWorks*. Retrieved from https://www.mathworks.com/matlabcentral/fileexchange/4150-dea-solver-light

Economy and Finance. (2018). *Gov*. Retrieved from https://www.gov.za/about-sa/economy

Färe, R., & Zelenyuk, V. (2015). Pricing of decision-making units under non-constant returns to scale. *Journal of the Operational Research Society*, *66*(1), 172–173.

C2 General

Forsten-Astikainen, R., Hurmelinna-Laukkanen, P., Lämsä, T., Heilmann, P., & Hyrkäs, E. (2017). Dealing with organisational silos with communities of practice and human resource management. *Journal of Workplace Learning*.

Filstad, C. (2004). How newcomers use role models in organisational socialisation. *Journal of Workplace Learning*.

Fried, H. O., Lovell, K. C. A., & Schmidt, S. S. (1993). *The Measurement of Productive Efficiency* New York: Oxford University Press.

Golany, B., & Roll, Y. (1989). An application procedure for DEA. *Omega*, *17*(3), 237–250.

Gibbs, N. (2020, February 26). *How Purpose and Mission Impact Real Business Outcomes*. Beehive. https://beehivepr.biz/how-purpose-and-mission-impact-business/

Han, Jeongyun, Kim, K. H., Rhee, W., & Cho, Y. H. (2020). Learning Analytics Dashboards for Adaptive Support in Face-to-Face Collaborative Argumentation. *Computers & Education*, 104041.

Han, Junghee, & Park, C. (2017). Case study on adoption of new technology for innovation: Perspective of institutional and corporate entrepreneurship. *Asia Pacific Journal of Innovation and Entrepreneurship*, *11*(2), 144–158. https://doi.org/10.1108/APJIE-08-2017-031

Harmeling, C. M., Moffett, J. W., Arnold, M. J., & Carlson, B. D. (2017). Toward a theory of customer engagement marketing. *Journal of the Academy of Marketing Science*, *45*(3), 312–335.

C2 General

Harrysson, M., Schoder, D., & Tavakoli, A. (2016, June 29). *The evolution of social technologies | McKinsey*. https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/the-evolution-of-social-technologies#

Hosanagar, K. (2019). *A humans guide to machine intelligence: How Algorithms are shaping our lives and how we can stay in control* (1st ed.). Viking.

Hulten, C. R. (2001). Total factor productivity: A short biography. In *New developments in productivity analysis* (pp. 1–54). University of Chicago Press.

Huczynski, A. A., & Buchanan, D. A. (2013). *Organisational Behaviour*. Harlow: Pearson.

Hussain, S. T., Lei, S., Akram, T., Haider, M. J., Hussain, S. H., & Ali, M. (2018). Kurt Lewin's change model: A critical review of the role of leadership and employee involvement in organisational change. *Journal of Innovation & Knowledge*, 123-127.

Ismail, S., Malone, M. S., & Geest, Y. v. (2014). *Exponential Organisations: Why New Organisations are Ten Times Better,Faster and Cheaper than yours (and What to do about it)*. New York: Division Books.

Kiron, D., Kane, G. C., Palmer, D., Phillips, A. N., & Buckley, N. (2016). Aligning the organisation for its digital future. *MIT Sloan Management Review*, *58*(1).

Kumar, V., Rajan, B., Gupta, S., & Dalla Pozza, I. (2019). Customer engagement in service. *Journal of the Academy of Marketing Science*, *47*(1), 138–160.

Lewin, K. (1936). *Principles of topological psychology* (First ed.). New York: McGraw-Hill Book Company.

C2 General

Loozen, T. (Producer). (2019, February 12). Digital transformation for 2020 and beyond: eight telco considerations. *EY*. Retrieved from https://www.ey.com/en_gl/tmt/digital-transformation-for-2020-and-beyond-eight-telco-considera

Mackey, J., & Sisodia, R. (2014). *Conscious Capitalism*. Boston, Massachusetts: Harvard Business School Publishing Corporation.

Matheus, R., Janssen, M., & Maheshwari, D. (2018). Data science empowering the public: Data-driven dashboards for transparent and accountable decision-making in smart cities. *Government Information Quarterly*, 101284.

McLaughlin, C. P., & Coffey, S. (1990). Measuring productivity in services. *International Journal of Service Industry Management*, *1*(1), 0–0.

Mikkonen, S., Pylväs, L., Rintala, H., Nokelainen, P., & Postareff, L. (2017). Guiding workplace learning in vocational education and training: A literature review. *Empirical Research in Vocational Education and Training*, *9*(1), 9.

Mohout, O., & Kiemen, M. (2017). *A critical perspective to exponential organisations and its hyper scalability*.

Mullins, L. J., & Christy , G. (2016). *Management & Organisational Behaviour*. Harlow CM20 2JE: Pearson.

Omarjee, L. (Producer). (2019, July 30). SA unemployment rate jumps to 29%, the worst since 2008. *Fin24*. Retrieved from https://www.fin24.com/Economy/just-in-sa-unemployment-rate-jumps-to-29-the-worst-since-2008-20190730

C2 General

Ramparsad, S. (2016). *Impact of organisational structure on evidence-based decision making: The matrix versus hierarchical* [PhD Thesis]. University of Pretoria.

Rifkin, J. (2014). *The Zero Marginal Cost Society*. New York: Palgrave Macmillan.

ŞAHİN, H., & TOPAL, B. (2018). Impact of information technology on business performance: Integrated structural equation modeling and artificial neural network approach. *Scientia Iranica*, *25*(3), 1272–1280.

Soheilirad, S., Govindan, K., Mardani, A., Zavadskas, E. K., Nilashi, M., & Zakuan, N. (2018). Application of data envelopment analysis models in supply chain management: A systematic review and meta-analysis. *Annals of Operations Research*, *271*(2), 915–969.

South African CEOs are struggling to find digital skills. (2018, July 17). *Businesstech*. Retrieved from https://businesstech.co.za/news/business/258889/south-african-ceos-are-struggling-to-find-digital-skills/

The Power of Purpose: How Organisations are Making Work More Meaningful Northwestern University | School of Education & Social Policy. (n.d.). Retrieved 29 October 2020, from https://www.sesp.northwestern.edu/masters-learning-and-organizational-change/knowledge-lens/stories/2016/the-power-of-purpose-how-organizations-are-making-work-more-meaningful.html

Thomke, S. (2020, March 1). Building a Culture of Experimentation. *Harvard Business Review*. https://hbr.org/2020/03/productive-innovation

C2 General

UCLA. (2019). What does cronbach's Alpha mean. Retrieved from https://stats.idre.ucla.edu/spss/faq/what-does-cronbachs-alpha-mean/. from UCLA https://stats.idre.ucla.edu/spss/faq/what-does-cronbachs-alpha-mean/Batuo, M. E. (2015). The role of telecommunications infrastructure in the regional economic growth of Africa. *The Journal of Developing Areas*, 313–330.

Uzialko, A. (2019, April 22). *How Artificial Intelligence Is Transforming Business—Businessnewsdaily.com*. Business News Daily. https://www.businessnewsdaily.com/9402-artificial-intelligence-business-trends.html

Vásquez-Correa, M. C., & Rodas, H. L. (2019). A robust approach for principal component analyisis. *ArXiv Preprint ArXiv:1903.00093*.

Vasumathi, A., Sagaya, M. T., & Poranki, K. R. (2019). The impact of emotional intelligence on work life balance among the faculty members' performance in the private universities using multivariate analysis, Tamil Nadu, India-an empirical study. *International Journal of Services and Operations Management*, *34*(1), 1–20.

Walsh, M. (2019, November 19). Why Business Leaders Need to Understand Their Algorithms. *Harvard Business Review*. https://hbr.org/2019/11/why-business-leaders-need-to-understand-their-algorithms

C2 General

Warren, R. (1993). *Purpose Driven Life*. Colorado Springs: Wheaton, IL:Tyndale House Publishers(1979).

Watkins, K. B., Hristovska, T., Mazzanti, R., & Wilson, C. E. (2013). *Measuring Technical, Allocative, and Economic Efficiency of Rice Production in Arkansas using Data Envelopment Analysis*. Retrieved from Stuttgart:

Westerman, G., Bonnet, D., & McAfee, A. (2014). *Leading Digital*. Boston, Massachusetts: Harvard Business Review Press.

Zhu, J. (2015). *Data Envelopment Analysis "A handbook of Models and Methods"*. Worcester , MA, USA: Springer.

C2 General

APPENDIX A : DEA MATLAB Instrument

```
“function[Efc] = DEASolver(X,Y,vouc,eoum,iouo);
% DEASolver intends to be a educational tool to make light DEA analysis
% It had been already tested to Input X Output matrix up to 5 X 5.
%
% Syntax: DEASolver(X,Y,vouc,eoum,iouo), where:
% X - Input Matrix (iXk)
% Y - Output Matrix (jXk)
% vouc - 'V' to Variable Returns do Scale and 'C' to Constant Return to Scale
% eoum - 'E' to Envelopment analysis, 'M' to Multipliers analysis
% iouo - 'O' to Output analysis, 'I' to Input analysis
%
% the VRS/M/O option is not working correctly yet
% Its 2 phase PPL code is based on Jeff Stuart code at File Xchange Matlab home page
% Kaoru pg 12.mat is the example model used by the book DATA ENVELOPMENT ANALYSIS from
WW Cooper, LM Seiford and KAORU TONE
%
% DEA light Code from Alvimar de Lucena, Aer Eng, ITA 97
verif=0; % checks syntax probls
i=size(X,1); % verify #Inputs
j=size(Y,1); % verify #Outputs
k=size(X,2); % verify #DMUs
if k ~= size(Y,2)
    disp('Input Matrix and Output Matrix has different number of DMU')
end % end check size of DMU
% Check Variable Return to Scale
if (vouc=='V' | vouc=='v')
    OPT(1)=1;
elseif (vouc=='C' | vouc=='c')
    OPT(1)=0;
else
    disp('VRS Option not valid')
    verif=1;
end
% Check kind of Analisys E or M
if (eoum=='E' | eoum=='e')
    OPT(2)=1;
elseif (eoum=='M' | eoum=='m')
    OPT(2)=0;
else
    disp('E or M Option not valid')
    verif=1;
end
% Check Out or Input analisys
if (iouo=='I' | iouo=='i')
    OPT(3)=1;
elseif (iouo=='O' | iouo=='o')
    OPT(3)=0;
else
    disp('Out or Input Option not valid')
    verif=1;
end
if verif==1
    disp('Try again')
elseif OPT==[0 0 0]
    DEACRSMO(X,Y)
elseif OPT==[0 0 1]
```


C2 General

```
    DEACRSMI(X,Y)
elseif OPT==[0 1 0]
    DEACRSEO(X,Y)
elseif OPT==[0 1 1]
    DEACRSEI(X,Y)
elseif OPT==[1 0 0]
    DEAVRSMO(X,Y)
elseif OPT==[1 0 1]
    DEAVRSMI(X,Y)
elseif OPT==[1 1 0]
    DEAVRSEO(X,Y)
elseif OPT==[1 1 1]
    DEAVRSEI(X,Y)
End "
```

(DEASolverLight, 2003)

C2 General

APPENDIX B : Ethical consideration

Table 9: Ethical Issues Source (Creswell, 2014)

Where in the Process of Research the Ethical Issue Occurs	Type of the Ethical issue	Addressing the issue
Prior to conducting the research	I. Compile with the standard university code of conduct. II. Get approval from the organisation where the research will be conducted. III. Negotiate the authorship of the research with the organisation.	Submit the proposal to the PGC committee for approval. Submit the proposal to the organisation where data will be sourced and research conducted, approval should be obtained. Give credit to the organisation if the organisation approves and also any employees involved.
Beginning the study	I. Identify the research problem that will benefit the participants. II. Disclose the purpose of the study. III. Do not pressure the participants to sign the consent. IV. Be sensitive to the needs of a vulnerable population	I. Conduct an informal needs conversation with the affected participants. II. Inform participants on the purpose of the study. III. Inform the participants that they are not forced to sign the consent form.

C2 General

		IV. Obtain appropriate consent for the vulnerable population.
Collecting data	I. Respect the site, disrupt as little as possible. II. Make sure all participants receive the same treatment III. Avoid deceiving the participants. IV. Respect the potential of power imbalances and exploitation of participants. V. Do not use the participants by gathering data and leaving the site. VI. Avoid collecting harmful information.	I. Build trust II. Follow the data collection procedure III. Discuss how the data will be used. IV. Avoid disclosing sensitive information. V. Find ways of rewarding participants.
Analysing data	I. Avoid siding with participants. II. Avoid disclosing only positive results. III. Respect the privacy anonymity of participants.	I. Report multiple perspectives II. Report contrary findings. III. Assign fictitious names or aliases; develop composite profiles.
Reporting, sharing and storing data	I. Avoid falsifying authorship, evidence, data findings and conclusion. II. Do not plagiarise. III. Avoid disclosing information that would harm participants. IV. Communicate in a clear, straightforward, appropriate language. V. Share data with others. VI. Keep raw data and other materials.	I. Be honest II. Use composite stories so that individuals are not identified. III. Use unbiased language. IV. Provide the report to the participants or stakeholders. V. Store data and materials for five years.

	VII. Do not duplicate or piecemeal publication. VIII. Provide complete proof of ethical compliance. IX. State who owns the data in the study.	VI. Refrain from using the collected data for more than one research. VII. Give credit for any involvement in the research.