APPROVED TITLE

How Brand Function and Corporate Image Create Loyalty in North America, Europe, and Africa's Telecom Service Providers

by

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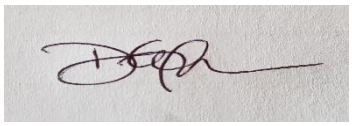
How brand function and corporate image create loyalty in North America, Europe, and Africa's Telecom service providers.

I declare that the above dissertation/thesis is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.



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Summary

Brand loyalty is seen as a repeat purchase and also the ability to recommend services or products. Telecommunication service providers require loyal customers to stay in business. The current thesis examines the impact of how brand function and corporate image create loyalty in North America, Europe, and Africa's telecom service providers. The researcher employed an anonymous online survey in Africa, Europe, and North America. A total of 971 responses were received. Using Partial Least Square regression analysis, the research examined the relationship between the variables: Brand Function, Corporate Image and Loyalty. The study found that brand function and corporate image has a significant positive effect on customer satisfaction. In addition, the research used machine learning algorithm to model the best prediction for consumer recommendation of products and services through their telecommunication service provider to friends and family.

Keywords: Telecommunications, Brand Engineering, Brand Function, Corporate Image, Culture, Brand Loyalty, Customer Satisfaction, Machine Learning, Predictive Modelling, Structural Equation Modelling

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List of Contents

List of Figures

List of Tables

Terms and definitions

Term	Definition
AI	Artificial Intelligence
ANN	Artificial Neural Network
AARS	Average adjusted R-squared
AVIF	Average block VIF
AFVIF	Average full collinearity VIF
APC	Average path coefficient
AT	Auxiliary Theory
ARS	Average R-squared
AVE	Variance Extracted Estimate
CBBE	Customer-Based Brand Equity
CEO	Chief Executive Officer
CFA	Confirmation Factor Analysis
CI	Computational Intelligence
CMV	Common Method Variance
DT's	Decision Tree's
G	Germany
GB	Great Britain
ML	Machine Learning
NA	North America
NBC	Naïve Bayes' Classifier's
NN	Neural Network
PLS	Partial Least Squares
PLS-SEM	Partial Least Square Structural Equation Model
RSA	Republic of South Africa
SEM	Structural Equation Modelling
SERVPERF	Service Performance
SERVQUAL	Service Quality
SGD	Stochastic gradient descent
SVM	Support Vector Machine
SWOT	Strength Weakness Opportunity Treats
Telecom	Telecommunication
UNISA	University of South Africa

CHAPTER 1
Introduction and project overview

1.1 Introduction and background

The telecommunication industry has grown worldwide due to the increasing demand of people wanting to stay connected to loved ones or businesses seeking telecommunications infrastructure to have a competitive advantage over their competitors.

Globally, there are about 5.2 billion mobile users (GSM Association, 2020). AT&T, Verizon Wireless and Rogers Communications are three of the top North American telecommunication service providers (Editor, 2019) while MTN, Orange and Orascom telecommunications service providers are leading African telecommunication service providers (Minnock, 2019). British Telecom (UK) and Vodafone are two of Europe's top telecommunication service providers (O'Dea, 2019). In Africa, there are approximately 213 telecommunication service providers, while Europe has about 830 mobile operations, and there exist around 130 mobile operators in North America (Issa & Jha, 2019). With such fierce competition throughout the continents, one may ask, what sets apart the individual operators within each continent? What creates uniqueness which either attracts or retains customers in such a robust and competitive environment? Is it brand and what is brand in telecommunications?

Furthermore, why do brands matter? According to (Zimmer & Kapferer, 2013), brands are economically beneficial to organisations because they help consumers in identifying products belonging to such organisations. When consumers understand the brand, they can already decide on the product. This brand awareness may allow consumers to lower their search costs based on what they already know about the brand quality and other brand attributes; therefore, customers have a reasonable expectation about the product or service they are seeking.

1.2 Problem statement and research questions

In the current circumstances, where the competition for customers among telecommunication service providers is fierce, one is bound to ask what sets one service provider apart from another so that they gain new customers and at the same time retain their existing customers, and avoid losing them to their competitors. Loyalty is what keeps existing customers to brands. Brand loyalty can be achieved by what the brand stands for, provides, how it provides, satisfaction, attachment and association among other things.

The primary research question for the study is, how does brand function and corporate image create loyalty in telecommunication service providers in Africa, Europe, and North America? The current research investigates how brand function and corporate image along with service quality, value, culture and satisfaction as a combination leads to brand loyalty in the telecommunication service industry. The research investigates these phenomena in Africa, Europe and North America.

1.3 Research Aim and Objectives

The research aims to examined the impact of brand function and corporate image on loyalty in telecommunication service providers in Africa, Europe, and North America.

The objective of the research is to examine if there are significant positive effect between the below-stated relationships which leads to customer loyalty:

- Brand function and service quality
- Service quality and value, corporate image, satisfaction, culture, loyalty.
- Culture and satisfaction, loyalty and corporate image
- Corporate image and value, loyalty and satisfaction
- Value, satisfaction and loyalty

1.4 Research contribution

This research will provide a comparative analysis on how brand function and corporate image creates loyalty in three continents namely; Africa, Europe and North America.

The study introduces a two-step approach using a conceptual model derived from structural equation modelling and machine learning algorithms. The conceptual model is formulated through existing research such as by (Lai, et al., 2009), (Hapsari et al., 2016), (Hu et al., 2009), (Gantsho & Sukdeo, 2018), (Lam, 2007) and (Hopkins et al., 2009) which does not include brand function and culture. The study by (Lai et al., 2009) focuses on Chinese telecommunication providers only. While (Lai et al., 2009), (Hapsari, Clemes, & Dean, 2016), (Hu, Kandampully, & Juwaheer, 2009), (Gantsho & Sukdeo, 2018), (Lam, 2007) and (Hopkins, Nie, & Hopkins, 2009) focused on satisfaction, value, image, culture, service quality and loyalty, the current study extends on the previous studies by adding brand function construct and extending to multiple continents to provide a holistic view on how brand function and corporate image creates loyalty among telecommunications service providers. The study adds

machine learning to evaluate algorithms that predict loyalty that is shown either by remaining on the same mobile operator and/or by being able to recommend the products and services of their mobile operator to friends and family.

1.5 Thesis structure

The thesis is divided into chapters as follows:

Chapter 1 – Introduction

Chapter 2 – Literature Review

Chapter 3 – Research Methodology

Chapter 4 – Data Analysis

Chapter 5 – Regression Analysis and Hypothesis testing

Chapter 6 – Prediction Modelling

Chapter 7 – Conclusion and Contributions

CHAPTER 2
Review of Literature

2.1 Introduction – Brand Science and Engineering

Branding in science and engineering, as it relates to goods and services is used to differentiate goods of one producer from those of another producer (Zimmer & Kapferer, 2013). Furthermore, it can be a form of a term, sign, design, name, or a combination of any of these to identify goods and services from one competitor as compared to another (Franzen & Sandra, 2008; Zimmer & Kapferer, 2013).

The tribes in Africa often cut the end of an ear of a goat or cow uniquely as a way to mark their livestock. This kind of practice is well known among men herding livestock. It is used to identify one's livestock and thus differentiate it from stock belonging to a neighbour since often, herd men mix their livestock in grazing fields and only separate their livestock when they return home. While some opted to cut the comb of the chicken in a certain way, others installed rings of different colours on the chicken's toes or claw or feet. In essence, this is a way of branding or brand identification.

The use of marble and pillars on buildings is a style used by Europeans especially the Greeks. This form of architecture, often referred to as art, is what identifies European architecture to the rest of the world. The style has many characteristics which defines the purpose of the building, be it a residential, home or church (Lynch, 2015).

Suit wearing had its origin in Europe after King Charles II asked for his courtiers to tone down on clothing. As a result of this, the courtiers began to dress in what can be referred to as the modern business suit wear. This kind of dressing was a brand identity for the courtiers as it set them apart from everyone, and their status was known through their dress code.

In America, Native Americans tattooed each other as a way of uniquely identifying each member of the tribe and differentiating them from other tribes. The tattoos were also used to signify a victory for those that have been to battle and won and to signify their geographical origins within the continent (Indians.org, 2018).

Communication can be between one or more persons next to each other, or kilometres apart. It is relatively easy to communicate with another person when they are next to you; it could be

rather challenging if the person you want to communicate with is not next to you. If the person is not next to you, one can scream or write a letter and send it by post. The complexity comes when one wants to communicate in real-time with a person who is not nearby; then this is where telecommunications comes in, as a solution to the given predicament. Telecommunications provide real-time communication between persons and machines no matter their distance.

2.2 A brand

Branding is used to differentiate one organisation from the competition and is a strategic tool for decision making (Aaker, 1996; Keller, 2002). Branding is not only physical, it can be intangible like corporate culture to show how an organisation can showcase its internal and external identity from other competitive entities (Zimmer & Kapferer, 2013). For example, whenever a marketer embarks on the creation of a new name or symbol or logo for a new or existing product, he or she is creating a brand.

A brand is an interrelated system used to differentiate goods from those of a competing supplier (Franzen & Sandra, 2008). In principle, a brand is a perception that lives in the mind of the customer such as image, word, phrase, logo, symbol, the design of which can be used to identify goods and services of an organisation as well as individual sellers (Heding et al., 2008).

Branding can be enhanced by packaging a certain product in a particular way so that it appeals to its target audience; this is a means to set a particular organisation or product apart from other organisations or products that offer the same or similar service or product. The study of brand engineering looks into the methods and strategies which an organisation can use to package itself and/or its product. This particular kind of branding is used to attach a certain value and quality, a certain outlook and also appeals directly to a targeted audience so that it resonates with the audience in a manner that the audience can easily associate with the product or service or organisation.

This branding creates a special preference for the branded product or service, it necessitates immediate attention from its audience and creates a subconscious entry into minds while at the same time attaching emotional value in their hearts. All of the objectives of branding are to create an easy acceptance of the product and service offered, thereby promoting brand loyalty. Keller and Lehmann (2006) explain that brands are financial vehicles for an organisation. Longeteig (2010) explains that branding is more than just a logo or a slogan; branding is a

promise that is delivered. Furthermore, the customer will let you know if your brand's personality is no longer favoured. If your brand is no longer favoured, it could be time for repositioning.

Table 2.1: Comparison and analysis of brand definitions

Sources	Phrase	Design	Personality	Complex	Slogan	Logo	Image	Tangible	Financial Vehicles	Product	Service	Intangible	Promise
(Keller & Lehmann, 2006)			X					X	X	X			
(Longeteig, 2010)			X	X	X	X	X	X		X			X
(Franzen & Sandra, 2008)				X						X	X		
(Becerra & Badrinarayanan, 2013)				X				X		X		X	
(Zimmer & Kapferer, 2013)	X					X	X	X		X	X		
(Kotler, 1992)	X	X				X	X	X		X			
(Heding, Knudtzen, & Bjerre, 2008)		X				X	X			X			

Table 2.2: List of selected brands and their founders by (Franzen & Sandra, 2008)

Brand Name	Inventor/Founder	Continent	Year	Original Product
Twitter	Jack Dorsey, Biz Sone, Noah Glass, Evan Williams	North America	2006	Social Networking service
Microsoft	Bill Gates, Paul Allen	North America	1975	Software
Gillette	King C. Gillette	North America	1901	Disposable razors
Boeing	William Boeing	North America	1916	Aeroplanes
Tupperware	Earl W. Tupperware	North America	1938	Plastic storage boxes

Oracle	Larry Ellison	North America	1977	Database software
John Deere	John Deere	North America	1837	Steel plough
Douwe Edgerts	Douwe Edgerts	Europe	1753	Coffee and Tobacco
Benz	Karl Benz	Europe	1883	Automobile in its current shape
Channel No.5	Gabrielle Channel	Europe	1919	Perfumes
Dunlop	John Boyd Dunlop	Europe	1888	Air tire
Philips	Anton and Gerard Philips	Europe	1891	Light Bulbs
Benz	Karl Benz	Europe	1883	Automobile in its current shape
Adidas	Adolf Dassler	Europe	1949	Shoes, clothing, and accessories
Thawte	Mark Richard Shuttleworth	Africa	1995	Certificate authority for X.509
Dangote Cement	Aliko Dangote	Africa	1981	Cement
DSTV	MultiChoice	Africa	1995	Broadcaster
Econet Global	Strive Masiyiwa	Africa	1993	Telecommunications
Jumia	Sascha Poignonnec, Raphael Kofi Afaedor, Tunde Kehinde	Africa	2012	Marketplace
Glo	Mike Adenuga	Africa	2003	Telecommunications

2.3 Brand Function

A brand function illustrates the nature of the product or service or experience type or brand provided benefits, while the descriptive modifier distinguishes the nature of the product or service (Franzen & Sandra, 2008; Mohan et al., 2017). Brands are build based on a product that can serve multiple purposes for an organization with their basic level being a marketer for their organization; as for the customer, brands offer the simplicity to make a choice and the ability to reduce risk by purchasing a product of a certain quality and trust (Keller & Lehmann, 2006).

Increased information efficiency, risk reduction and value-added or image benefit creation are important brand functions in the business to business arena (Sugawara & Nikaido, 2014).

2.3.1 Functional and non-functional Attributes

Brand functionality can either be functional or non-functional (Mohan, Jiménez, Brown, & Cantrell, 2017)

Table 2.3: Functional and non-functional Attributes

Functional Attributes	Non-functional attributes
Reliability	Self-concept connections
Competence	Image
Skilfulness	Emotions
Usefulness	Trustworthiness
Quality	Attachment

Six brand functions by (Romaniuk & Sharp, 2004):

- Guarantee; the brand creates inconsistent thought in the mind of its customers; therefore customers think that the brand is backed by a responsible manufacturer who will take accountability should there be a problem.
- Simplification; the brand acts as a learning medium for certain knowledge to its customers.
- Differentiation; the brand allows its customers to be able to spot differences between it and its competitors.
- Mentalization; the brand helps customers by giving them some form of perceived protection when owning the brand.
- Symbolism; the brand gives out information about the people who are using it.
- Generic function; the brand is created to serve a particular product category.

2.3.2 The organizational view of brand functions

Organizations view brands as a driver of revenue, for instance, the brand exists so that the organization can be competitive in a specific product category. The branded product is unique so that it can be special to consumers; the meaning of uniqueness is achieved by making the product meaningful and transforming for the consumer. This strengthens the brand's equity,

when a brand's equity is substantial the organization can have economic advantages as follows (Franzen & Sandra, 2008; Keller, 2002):

- Consumers' preference for the brand grows, and in turn, the brand is purchased more.
- Consumers who prefer the brand market the brand.
- The brand influences buyers positively; therefore, brand preference increases.
- High sales volumes mean there is a stable income and this can lead to increased market share.
- High sales volumes may lead to high profits.

2.3.3 The complexity of brand functions

Romaniuk & Sharp (2004) outline that brands can have several functions at the same time for a variety of groups of people. The brand can have several functions at different moments, such as before purchase, during purchase, during usage, and after purchase. Not all the different functions of a brand are seen equally or considered to be equally important. Some do not add much value; they could just be there for the brand's category (Franzen & Sandra, 2008). Functions of competing brands can differ for brands that are in the same product category.

2.3.4 The Purchasing behaviour function

According to (Franzen & Sandra, 2008; Mohan et al., 2017) the main functions which brands perform are found in the functions they fulfil, how their purchase activities are done, in particular how these activities deal with the facilitation and reduction of risk. Purchasing behaviour is an essential activity with the following as the most important aspects:

Table 2.4: Purchasing behaviour aspects

Aspect	Explanation / Characteristics
Understanding	The brand takes an authoritative function that guides the customer or consumer to understand the brand and how the brand must be purchased and consumed.
Simplification	Identification: the brand name is the crucial factor that tells a lot about the brand for identification. Optimization: the brand guides in determining the best product from the category.

	Repetition: the brand helps with the process of purchasing the same thing again and again without having to repeat the same cognitive effort when purchasing the same product.
Security	Functional security: the brand provides security in the continuity of supply. The composition, quality, test, and user experience are constant; therefore, the consumer knows what to expect with the brand; it is never a new experience. Social security: the brand offers social security and acceptance among colleagues, friends, and society
Risk Reduction	Trust in the producer: the familiarity of the brand reduces risk or perceived risk. Follow-up: consumers want the ability to contact the producer should they feel the product is not of the quality or function they know.

2.3.5 The symbolic function

A brand can be used as a form of communication (Nguyen et al., 2018), symbolic meaning comes through the process of interaction between members of a particular culture or subculture (Franzen & Sandra, 2008). The messages which the brand sends out are associated with the brand to form brand value categories with symbolic meanings, as follows:

Table 2.5: The symbolic function categories

Category	Meaning/explanation
Brand values	The association between a brand and existing values
Brand personality	The associative relationship between a brand and human characteristics like honesty, sincerity, liveliness, or thoughtfulness
User image	The relationship between the brand and its perceived socioeconomic and brand personality
Lifestyle	The association of the brand to a particular lifestyle
Brand emotions	The realization that certain emotions are associated with the brand.

2.3.6 Brand System

A brand system is comprised of a complex network of components which are interlocking sets of definable elements, the structure of relationships that illustrates the identity of the system as well as the conduct points where interactions take place (Franzen & Sandra, 2008). It is hierarchical (Aaker, 1996). There are two types of brand systems namely; corporate brand management and consumer brand system.

A brand has two sides, these make up the controlling system of branding:

2.3.6.1 The corporate brand management

This represents the body that has the strategic function of making decisions relating to brand identity, doing marketing research, and developing brand strategy and product development.

2.3.6.2 Consumer brand system

This represents the consumer perspective, and how the consumer takes in the brand experience, brand messages, and forms a brand perception. This is often not in control of the organisation. Consumers strive to get the best deal for their money at different organisation expense. The best deal and the organisation expense are seen as two actors in the brand conversation model. The two can work in parallel although they can often compete with one another in decision making when it comes to serving the interests of the consumer.

2.3.7 Brand Strategy

One of the difficulties in developing a brand strategy is the realization that building a brand strategy is an ongoing process (Longeteig, 2010). A good brand strategy must last as long as possible (Sugawara & Nikaido, 2014).

The following are three specific steps to developing a brand strategy (Longeteig, 2010).

Table 2.6: Strategy development steps

Step/Action	Action Items/Explanation
Identify	• Identify several market factors like target customers, competition, positioning the service.

	• Keep a narrow focus by working on the targeted base, then expand later. • Identify the unique selling proposition by working with referrers. • The "gap" in the market will then give direction on the marketing efforts.
Develop	• The development stage is where the marketing and action plan is created. • In this phase, efforts should be focused on messages to customers, images, and interactions at all levels of the organization with that person that will represent the brand. • All forms of communication must work to serve the overall objectives and goals.
Execute and Monitor	• The strategy must be communicated internally to everyone so that it is understood and everyone knows their role in it and what is expected of them. • Everyone must participate in the communication of the brand externally; this then makes everyone responsible for representing and managing the brand.

2.3.7.1 Brand Strategy Concepts

In the beginning, the focus of the brand strategy is establishing the function of the brand and how it can relate to customers or consumers as well as setting the brand apart from its competitors (Kapferer, 2008).

2.3.7.2 Strategy implications

Basic brand strategy is derived from the essential function a brand has for its consumers and suppliers (Franzen & Sandra, 2008). Five basic strategies of brand functions:

Table 2.7: Basic strategy from brand function analysis

Strategy	Meaning/Explanation
Signalling strategy	The focus of communication is on how the product works as a means of identification; therefore the brand name, packaging, and external characteristics are central in the communication

Confidence strategy	Communication is centred on the reliability of the brand supplier
Product-focused strategy	Communication is centred on the properties and functions of the product.
Symbolic strategy	Communication is centred on the symbolic meaning of the product.
Relationship strategy	Communication is centred on the user by creating a feeling of relationship with the brand which persuades the user that the brand is interesting

2.3.7.3 Brand Strategy Development

A strategy is a value proposition with different sets of marketing activities (Porter, 1996). A strategy is coherent; the strategy has patterns, the strategy integrates the main goals and policies, and creates a series of coherent activities (Quinn, 1980). Every good strategy contains at least one of the following characteristics (Franzen & Sandra, 2008):

Table 2.8: Strategy characteristics

Characteristics	Explanation
Clear and concise goals	The goals of the strategy must be visible to everyone who is taking part in the strategy. The goals in the strategy insist that there is also coherence and continuity.
Simplicity	Strategies must be unambiguous and straightforward.
Motivation impact	Goals should speak to employees by making them realize their value.
Committed leadership	The top management should support the strategy and those implementing it and should remain committed.

2.3.7.4 Levels of strategy in brand management

Strategic thinking affects brand management at nearly all levels in an organization. The following table shows all the levels that affect strategic thinking (Franzen & Sandra, 2008).

Table 2.9: Levels of strategy in brand management

Level	Strategic brand decisions
Corporate	Choice of markets Organization goals Environmental surveillance

	Formulation of vision and mission Choice of organization/individual branding Endorsement planning Arrangement into strategic business units Choice of developments Allocation of means among strategic business units Organizational communication management strategy Organizational performance evaluation
Strategic business unit management	Business objectives Identification of prospective markets Competitive surveillance Brand choice Product brand combinations Allocation of means among brands Evaluation of business objectives
Marketing management	Marketing mix objectives Marketing research Selection of target groups Development of databases Segmentation strategies Market mix decisions Scheduling and budgeting Evaluation of marketing strategies
Brand Identity	Consumer insight research Setting brand objectives Brand concept planning Brand positioning planning Brand communication planning Brand architecture planning Evaluation of brand strategies
Brand contact point strategy	Setting marketing communication objectives Choice of communication target audiences and key stakeholders Choice of means Media communication Individual or two-way communication Other points of touchpoints Message strategies Budget allocation Evaluation of messages effectiveness
Media communication strategy	Setting media objectives Choice of medium vehicles Scheduling Budgeting Evaluation of media effectiveness
Individual communication strategy	Selection of target groups Identification of contact points Choice of means

	Word-of-mouth Personal sales Interactive Corporate response by listening Evaluation of individual contacts

At the business level, decisions are taken, which are related to choosing between the usages of corporate or individual brands. At the strategic business unit level, decisions are taken on the role of individual brands within the scope of the total brand portfolio and brand extension measures.

2.3.7.5 Four approaches to strategy development

i. The Rational/Analytical approach
This approach is based on analysis and quantitative analysis to explain the current situation, to isolate the influence of individual variables, and where possible, to calculate their individual impact. The approach consists of stages that must be gone through on an iterative basis, planned and carried out sequentially.

ii. The Creative/Intuitive Approach
In this approach, the choices made are primarily unconscious rather than conscious. Situations are dealt with intuitively. Brand managers take their decisions intuitively based on their power and guided by characteristics of vision and daring. The vision is based on imagination and can lead to an unpredictable brand position and possibly a different brand positioning.

iii. The Integration of Rational and Intuitive approaches
These approaches are complementary to one another. The two provide and balanced strategy formation, thereby providing strategic thinking as a result of analytical and mental elasticity. The table below shows the integrational of relational and intuitive approaches.

Table 2.10: The integration of relational and intuitive approaches

Elements	Rational/Analytic	Creative/Intuitive
Way of thinking	Reductive Step by step Analysing (SWOT)	Expansive Simultaneous Intuitive
Way of acting	Searching for the proper way	Searching for ways
Requirements	Precision control	Approach

iv. The knowledge versus experience-driven approaches

The approach assumes that there is sufficient knowledge that can be used to arrive at an effective strategy in the organization. The approach puts trust in the insights and evaluation capacities of the organization. When using experience, the organisation uses its experience gained through the years to arrive at an effective strategy.

2.4 Corporate Image

Any organisation has its own image which is perceived to be the mental pictures of that organisation by its stakeholders (Adeniji et al., 2014). Corporate image and reputation are linked and therefore act as a signal which the organisation uses to increase brand equity (Heinberg et al., 2018). Corporate image can be referred to as an image of what an organisation represents (Roberts-Bowman & Walker, 2020).

Characteristics of Corporate Image (Balmer, 2001):

- Psychology; is what the consumer perceives the corporate to be.
- Graphic design; is all the visual elements of the corporate.
- Public relations; is the relationship which the corporate has with its stakeholders.

2.4.1 Corporate image system

A corporate image system is made up of corporate appearance, corporate behaviour and corporate communication (Kocak, 2021).

- Corporate appearance; is how an organisation displays itself to stakeholders, this includes dress code, organisation behaviour and organisational norms.
- Corporate behaviour; is how an organisation behaves towards its stakeholders.
- Corporate communication; is how an organisation communicate itself and its products or services to its stakeholders.

2.4.2 Corporate image identity elements

Brand name, symbols and logos, characters, slogans, jingles, letterhead and corporate font make up brand elements (Aaker, 1996; Carolino & Santos, 2018; Franzen & Sandra, 2008). Brand elements are attributes that distinguish a brand or branded product or service from its competitors (Lindstrom, 2006). These elements are vital in forming a strong, recognizable brand. Without these elements, the brand can be blunt and less exciting and not appealing and

can be overshadowed by other competing elements, or can be easily be forgotten by targeted customers and consumers (Heding et al., 2008).

- Brand name; is the name of the organisation which it uses as part of its identity.
- Logos and symbols; are visual elements that play a meaningful role in building brand equity. Logos can range from names, trademarks, and words where as symbols can be a picture, art, and drawing.
- Characters; are used to identify a unique type of brand symbol by taking a real-life human character. They can be animated or live-action figures.
- Slogans; are short phrases that communicate clear or persuasive information about the brand. They are powerful brand instruments because they are very efficient at building brand equity.
- Jingles; are short musical phrases that are wrapped around a brand to promote it by using catchy lyrics or choruses.
- Letterhead; are used as templates for sending out official communication either on paper or by email which belongs to the organisation.
- Corporate font; is the font used by the organisation as part of its identity.

2.4.3 Building Corporate Image

Organisations build strong and supportive relationships with their suppliers, customers, community, investors etc. to sustain themselves (Adeniji, Osibanjo, Abiodun, & Oni-Ojo, 2014).

2.4.4 Factors influencing the corporate image

Farida & Ardyan (2018) explains six factors that influence corporate image from the perspective of the customer as follows:

- Corporate identity; these are elements like service, logo, company and price.
- Reputation; reputation and management are key in building a reputation in the eyes of the customer.
- Service offering; the services offered by the organization must be timely.
- Physical environment; physical service contribute positively to trust attributes that affect the corporate image.

- Personal contact; facilitated interactions will affect the evaluation and outcome of the image.
- Access of service; customers must get the correct service or get a timely service.

2.5 Brand Loyalty

Brand loyalty is a commitment to make repeat purchases (Farida & Ardyan, 2018). Loyalty can be explained as the ability to retain customers, through different means, which resonate with the customer, and can be physical or emotional. Furthermore, loyalty can be seen through brand resonance (Franzen & Sandra, 2008; Zimmer & Kapferer, 2013). The most crucial driver of brand equity is the achievement of brand loyalty (Kotler, 2006).

Positive relationships have been shown to exist between customer satisfaction and service quality and also between customer loyalty and service quality in telecommunication industries (Lai, et al., 2009; Venetis & Ghauri, 2004).

Loyalty programs are used to retain customers, herewith some tips on building loyalty programs (Aaker, 1996; Franzen & Sandra, 2008; Zimmer & Kapferer, 2013):

- Know your audience; by aiming the program at customers that can be changed by the introduction of the program.
- Change is good; any loyalty program which does not evolve will perish; therefore, frequently update the program to attract new customers and retain existing ones.
- Listen to your best customers; top customers can improve the programs; therefore, it is essential to listen to their comments and complaints.
- Engage people; offer rewards for joining the loyalty program, make it easy and enjoyable for customers.

2.5.1 Factors Influencing brand loyalty

Brand loyalty is influenced by brand name and aggressive marketing programs (Oppong-mensah & Adaku, 2018). Customer behaviour has an impact on brand loyalty (Unurlu, 2019).

2.5.1.1 Brand Resonance

Resonance is seen in intensity; therefore, the level of brand resonance is the type of relationship and the extent to which customers interact with the brand. This can be attributed to the depth of psychological relationship that customers or consumers have with the brand—the level of active attachment by purchasing the brand (Zimmer & Kapferer, 2013). Customers show a

significant level of brand loyalty through brand resonance which is the relationship created through brand identification with the customer (Kotler, 2006).

Brand resonance can be broken down into four categories

Table 2.11: Brand Resonance categories

Category	Meaning/Explanation
Behavioural Loyalty	Behavioural loyalty can be measured by repeat buying of the brand and also on the market share of the brand in the brand category (Kotler, 2006).
Attitudinal attachment	For resonance to happen, behavioural loyalty is not the only important aspect; the brand needs a strong personal attachment. Customers need to feel special about the brand so that it broadens their interaction and attachment to the brand (Zimmer & Kapferer, 2013).
Sense of community	A sense of community can be online or offline; a brand resonance can be achieved when a customer or consumer's brand loyalty is affirmed via brand engagement (Kapferer, 2008).
Active engagement	A sense of community can arise from when customers spend time with the brand by joining brand clubs, being part of emailing lists or buying branded merchandise associated with the product, by visiting websites or buying magazines with the brand on them. This is an active engagement with the brand.

2.5.1.2 Brand Equity

The concept of brand equity is to be able to capture the value of the brand (Kotler, 2006). Brand equity is a set of assets and liabilities connected to a brand which either increases or decreases the value provided by the branded product or service to a customer or consumer with the asset being: a) brand awareness b) brand loyalty c) perceived quality d) brand association (Aaker, 1996).

2.5.1.3 Brand Performance

Brand performance can be driven via brand awareness, revenue, perceived quality, satisfaction, associations, advocacy and loyalty (Coleman, 2018).

2.5.1.4 Brand Attachment

MacInnis et al. (2010) define brand attachment as the strength of the bond which connects the brand with the self. This brand attachment refers to memory networks of thoughts and feelings about the brand and its relationship to self. There are two crucial conceptual properties of brand attachment:

Table 2.12: Brand attachment conceptual properties

Concept	Explanation
Brand-self connection	Attachment involves emotions, and it is cognitive between the brand and the self. The consumer categorises the brand as part of self and therefore builds a sense of oneness relationship with the brand. The cognitive is representational and is inherently emotional.
Brand prominence	On top of brand-self, the number of positive feelings and memories of the brand in the customer's mind is seen as some form of brand attachment. Brand-self develops over time as memories and perceptions of the brand grow in the minds of consumers. Brand prominence shows the salience of the customer's cognitive and affection bond towards the brand, which connects the brand to self. The salience is shown by perceived ease and the frequency in which thoughts and feelings about the brand are brought into the customer's mind.

2.6 Service Quality (SERVQUAL)

Quality can be seen as the customer's expected product or service performance and the customer's perceived performance of the product or service (Adjei & Denanyoh, 2014). Service quality can be defined as the difference between a customer's perception of service rendered by an organization and the customer's expectation about the service offered by the organization (Berry et al., 1988). Gantsho and Sukdeo (2018) explain that service quality is the degree to which a customer's expectations of the product or service have been met.

2.6.1 Branding a service

In telecommunications, the service of telecommunication is a commodity. A commodity is just a product in its raw form that cannot be physically differentiable from a competitor in the minds of consumers (Zimmer & Kapferer, 2013). It is difficult to brand a service as it may not be a physical product in totality. However, this can be an advantage to companies offering branded services as this can be used to address intangibility and variability issues. Companies can use brand symbols to help them make the abstract nature of their service much more concrete. Branding a service can also be a tool for showing consumers that the company has designed a

specific service offering that is worthy of its name, and that it is unique. Service brands sell services and not physical products (Heding et al., 2008).

2.6.2 Brands a service provider

Brands are service providers, they provide a service for customers and consumers and are also service providers for their manufacturers; furthermore, the primary function of the brand can be seen as the central representation of the right of existence for the brand (Franzen and Sandra, 2008; Heding et al., 2008). There is a difference between functions for a brand, the brand has one function for its organisation and a different function for its consumers (Schmalhofer et al., 1992).

2.6.3 Measuring service quality

Gounaris et al. (2010) and Chinonso & Ejem (2020) measure service quality as follows:

Table 2.13: Measuring SERVQUAL

Dimension	Explanation
Tangible	Aesthetics and navigation
Reliability	Reliability and competence
Responsiveness	Responsiveness and access
Assurance	Credibility and security
Empathy	Communication to and understanding the individual

2.7 Customer Satisfaction

Customer satisfaction is a measure of how satisfied the customer is with the product or service (Attri & Kushwaha, 2018; Chinonso & Ejem, 2020). The uniqueness of the branded product or service is such that it is sustainable and gives customers or consumers compelling satisfaction and reasoning that they should buy it (Aaker, 1996). Brand performance can be driven via brand awareness, revenue, perceived quality, satisfaction, associations, advocacy and loyalty (Coleman, 2018).

2.7.1 Satisfaction index

Customer satisfaction is affected by 1) customer expectation 2) perceived value 3) customer complaints and 4) customer loyalty (Akhtari et al., 2015).

2.7.2 Customer Retention

Customer retention is defined as the customer's commitment towards the organisation and what the organisation offers in a particular period through repeat purchase and talking positively about the products or services of that organisation (Barusman et al., 2019)

2.7.3 Factors Influencing Customer Retention

Customer retention can be influenced by customer satisfaction, service quality and customer relationship management (Barusman et al., 2019).

2.8 Culture

Organizational culture is defined as a collection of beliefs, norms, behaviours, and values upheld in an organization (Gantsho & Sukdeo, 2018). According to (Mohelska & Sokolova, 2015), the culture created in an organization serves as a controlling mechanism that characterizes the behaviour and attitudes of employees and also the organization's conduct. An organization with a strong culture enjoys enhanced performance from its employees which leads to goals being achieved and overall performance of a high standard (Panagiotis et al., 2014).

National culture is defined as shared behaviour traits and a way of doing things by a group of people associated with a nation (Bankole, & Bankole, 2017).

2.8.1 Brand Culture

Brand culture is often referred to as organizational culture (Heding et al., 2008). When managing brand equity across geographic boundaries, cultures, and market segments, it is imperative to understand the different cultures of different geographic areas. Managers can leverage brand equity over geographic areas by relying on knowledge of behaviour and experience specific to those market segments and geographic areas (Zimmer & Kapferer, 2013).

2.8.2 National and Organisational Culture

Table 2.14: National culture dimensions (Hofstede, 2011)

Dimension	Explanation

Individualism	Individualism looks at the extent to which persons prefer to act alone rather than collectively in a group.
Power Distance	Power distance looks at the extent of inequality among persons.
Uncertainty Avoidance	Uncertainty avoidance looks at the extent to which people within a society avoid uncertainty and not so clear situations.
Masculinity	Masculinity looks at the extent to which people of a particular culture show values of affluence, assertiveness, achievement, material success, competition, and performance in comparison to maintaining human relations, having a good quality of life, caring for the weak, good service, and solidarity.

Table 2.15: Organisational culture characteristics (Needle,2004)

Characteristics	Explanation
Organization's Vision	The vision of the organisation.
Organization's Values	What the organization values and the value it provides.
Organization's Norms	The way the organizations does what it does.
Organisation's Systems	The systems which the organization uses to solve problems or deliver services.
Organization's Symbols	What the organization stands for and symbolizes.
Organization's Language	How the organization communicates.
Organisation's Beliefs	What the organization believes in.
Habits	The social habits within the organization.

Table 2.16: Organisational culture characteristics (Preskar & Žižek, 2019)

Characteristics	Explanation
Innovation	This is risk-oriented; when a higher value is put on innovation from employees this encourages higher performance by employees.
Attention to detail	This is precision-oriented; the level of accuracy at which employees are expected to maintain in their work.
Emphasis on outcome	This is achievement-oriented; the emphasis is on results, and not how results are obtained. This can have a negative effect.

Emphasis on people	This is oriented on fairness, treating employees with dignity and respect.
Teamwork	This is oriented on collaboration, working together as a team rather than individuals.
Aggressiveness	This is oriented on the competition with other organizations, the level of aggressiveness when competing in the same market.
Stability	This is oriented around rules set out by the organization.

Culture is a set of shared believes and a way of doing things by a nation and/or an organization. The characteristics of a nation and that of an organization can vary as the two may have different function and application of culture. Culture influences behaviour.

2.9 Perceived Value

Lin & Huang (2018) states that perceived value offers an important controlling mechanism on consumer behaviour, and perceived value is then defined as the summary assessment of the usage of a product based upon a perception of what is received versus what is given. Perceived value has a considerable effect on the purchase behaviour of a customer. Therefore organizations should keep on working on enhancing their customer's perception of their products and services so that organizations increase the lifetime value of customers for their organizations (Attri & Kushwaha, 2018)

The concept of brand equity brings about financial value, shareholder value, and brand strength (Franzen & Sandra, 2008). Brand equity is intangible (Heding et al., 2008).

2.9.1 Brand Value Chain

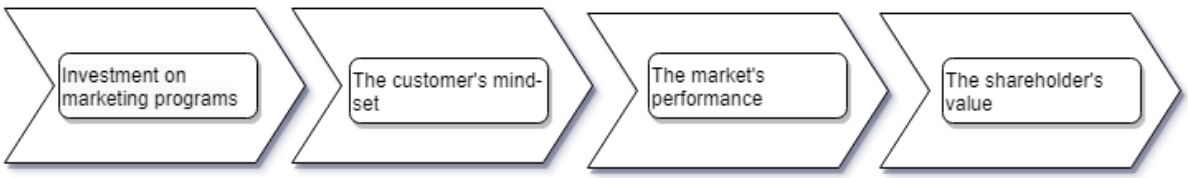

Figure 2.1: The brand value chain

The brand value chain model shows the value of each stage and how it leverages from the previous one, and in the end, the brand value brings financial value to its shareholders (Kotler, 2006). Brand value creation starts with the company doing marketing.

2.9.2 Perceived Value dimensions and measures

Table 2.17: Dimensions of perceived value (Attri & Kushwaha, 2018)

Dimension	Explanation
Consumer Value	It is what the consumer equates as value.
Customer Satisfaction	It is what satisfies the customer about the product or service.
Social influence	It is the influence that the product or service has on society.
Brand loyalty	It is the repurchasing behaviour of the customer who is being loyal to the brand.
Repurchase intention	It is the willingness to buy the product again.
Word of mouth	It is how word of mouth advertising affects the product or service negatively or positively.
Cross buying	Buying the same products from different brands and also buying different products from the same brand

Table 2.18: Measuring Perceived Value (Gounaris et al., 2007) have identified the following measures

Measures	Explanation/Attributes
Product value	Reliability Manufacturing quality Safety Durability Ease of use
Procedural value	Reliable procedures Flexibility and without delays or faults
Personal value	Helpful Friendly Knowledgeable Caring
Emotive value	Feeling good while using the product or service Feeling pleasant Looking forward to the same experience of the product or service
Social value	A good impression of using the product or service

	Good image when using the product or service Socially approved
Customer perceived sacrifice	Evaluated by the customer's perception about the value of the product in comparison to the asking price for the product or service

Table 2.19: Perceived value measurement (Lin and Huang, 2018)

Functional Values	Non-Functional Values
Rational and economic evaluations	Social and psychological effects
Physical product evaluations	Emotional and hedonic dimensions
	Post-consumption

2.10 Telecommunication Service providers

2.10.1 Telecommunications

Telecommunications is the exchange of information through electronic means of data, voice and video through technologies like fibre optics, telephone which can be fixed or mobile, radio, television and internet (Otsetova & Georgiev, 2018). There are two categories of telecommunications, fixed-wire and mobile (Whalley & Curwen, 2012).

- Fixed-wire; telecommunications offered via a cable to homes and organisations, an example would be fibre optics.
- Mobile; telecommunications offered to consumers wirelessly, an example would be mobile networks and radio.

2.10.2 Telecommunication service provider

Based on the definition of telecommunications by (Otsetova & Georgiev, 2018) a telecommunications service provider is an organisation that provides telecommunication to customers. A telecommunications service provider's market share is determined by the number of subscribers it has (Whalley & Curwen, 2012).

Telecommunication service providers can be classified into two types, Mobile Virtual Network Operator (MVNO) and Mobile Network Operator(MNO) (Son et al., 2019).

Table 2.20: Telecommunication service provider classification type

Type	Explanation
MVNO	A telecommunication service provider which doesn't own the network infrastructure which it uses to provide services to customers. It rents the network infrastructure from an MNO.
MNO	A telecommunication service provider which owns the network infrastructure. It can rent the network infrastructure to multiple MVNO.

A telecommunication service provider can be both an MNO and MVNO or any of the two, an example of this is MTN which operates as an MNO and MVNO. Telecommunication service operators can operate in different markets/countries.

2.10.2.1 Customer retention factors

Factors used by telecommunication service providers to attract and retain customers (Hidayati, et al., 2018; Polytechnic, 2019).

- Brand image; this what the brand stands for and the image it portraits to its stakeholders.
- Tariffs/plans; are either voice, data and/or messaging packages costs for the customer to choose their suitable tariff/plan based on their needs.
- Promotions; these are promotions on either handsets, data, voice or messaging which are marketed to the consumer.
- Coverage; this is the type of coverage the service provider has.
- Speed; this is the speed of the network coverage which users can experience for data applications.
- Network quality; this is the quality and reliability of the network to be able to provide the coverage and the speed with which is marketed to the consumer.
- Customer care service; is the service with which is provided to the customer.

2.10.2.2 Telecommunication service providers brand value and strength

Brand Finance (2020) has valued the following as the top 10 valuable brands in 2020

Table 2.21: Top valuable telecommunication service provider brands

Position Globally	Telecommunication service provider	Country	Brand evaluation in billion
1	Verizon	Unites States Of America	$63.692m
2	AT&T	Unites States Of America	$59.103m

3	China Mobile	Republic of China	$49.023m
4	T-Mobile/Deutsche Telekom	Germany	$39.956
5	NTT Group	Japan	$36.351
6	Xfinity	United States of America	$28.828
7	China Telecom	Republic of China	$20.059
8	Spectrum	United States of America	$19.266
9	Vodafone	Britain	$19.121
10	Orange	France	$18.131

Brand strength in table 2.15 is measured using these factors: marketing investment, loyalty, familiarity, staff satisfaction and corporate reputation (Brand Finance, 2020).

Table 2.22: Top strongest telecommunication service provider brands

Position Globally	Telecommunication service provider	Country	Brand Index Score out of 100
1	AIS	Thailand	92.1
2	MTS	Russia	90.9
3	Vodacom	South Africa	89.5
4	Jio	India	88.7
5	Telkom Indonesia	Indonesia	87.5
6	Swisscom	Switzerland	87.5
7	China Mobile	Republic of China	87.0
8	SK telecom	South Korea	86.6
9	KPN	Luxembourg	86.5
10	OPTUS	Australia	86.3

2.10.2.3 Africa

MTN is Africa's most valuable telecommunication service provider brand valued at $3.3 billion and has a brand strength rating of AAA (Brand Finance, 2020).

As of 2019, Sub-Saharan Africa had 477 million unique mobile subscribers which accounts for a 45% penetration rate as a percentage of the population, 272 million mobile internet users, 816 million subscriber identity module (SIM) connections which accounts for 77% penetration rate as a percentage of the population (GSMA, 2019). The mobile sector contribution to Gross Domestic Product (GDP) was $155 billion in 2019 which accounts for 9% of GDP. The industry had 650 000 jobs that are formally supported and 1.4 million informal jobs.

As of 2018, West Africa had 185 million unique mobile subscribers which accounts for a 48% penetration rate as a percentage of the population, 100 million mobile internet users, 328 million subscriber identity module connections which accounts to 86% penetration rate as a

percentage of the population (GSM Association, 2019). The mobile sector contribution to the gross domestic product was $52 billion in 2018, which accounts for 8.7% of GDP. The industry had 200 000 jobs that are formally supported and 800 000 informal jobs.

As of 2019, the Middle East & North Africa had 394 million unique mobile subscribers which accounts for a 65% penetration rate as a percentage of the population, 264 million mobile internet users, 636 million subscriber identity module connections which accounts for a 105% penetration rate as a percentage of the population (GSMA, 2020a). The mobile sector contribution to the gross domestic product was $422 billion in 2019 which accounts for 5.7% of GDP. The industry had 360 000 jobs that are formally supported and 640 000 informal jobs.

Table 2.23: African telecommunication service providers operating in different markets

Telecommunication service provider	Number of markets/countries
Orange	18
MTN	14
Airtel	14
Vodacom/Vodafone	7
Econet	3
Glo Mobile	3
Zain	2

Table 2.24: Africa's most valuable telecommunication service provider brands of the year 2020

Position in Africa	Telecommunication service provider	Country	Position globally
1	MTN	South Africa	43
2	Vodacom	South Africa	66
3	Safricom	Kenya	93
4	Glo Mobile	Nigeria	118

2.10.2.4 Europe

T-Mobile/Deutsche Telekom is Europe's most valuable telecommunication service provider brand valued at $39.956 billion and has a brand strength rating of AAA+ (Brand Finance, 2020).

As of 2017, Europe had 465 million unique mobile subscribers which account for an 85% penetration rate as a percentage of the population, 673 million subscriber identity module connections which accounts for a 123% penetration rate as a percentage of the population (GSMA, 2018). The mobile sector contribution to the gross domestic product was €550 billion

in 2017 which accounts for 3.3% of GDP. The industry created 1.1 million direct jobs and 1.4 million indirect jobs.

Table 2.25: European telecommunication service providers operating in multiple markets/countries

Telecommunication service provider	Number of markets/countries
Vodafone	21
T-Mobile/Deutsche Telekom	37
Orange	26
Movistar	11

Table 2.26: 2020 European's most valuable telecommunication service provider brands

Position in Europe	Telecommunication service provider	Country	Position globally
1	Deutsche Telekom	Germany	4
2	Vodafone	United Kingdom	9
3	Orange	France	10
4	Movistar	Spain	13

2.10.2.5 North America

Verizon is North America's most valuable telecommunication service provider brand valued at $63.692 billion and has a brand strength rating of AAA+ (Brand Finance, 2020).

As of 2019, North America had 324 million unique mobile subscribers which account for an 83% penetration rate as a percentage of the population, 403 million subscriber identity module connections which accounts for 104% penetration rate as a percentage of the population (GSMA, 2020b). The mobile sector contribution to the gross domestic product was $1.01 trillion in 2019 which accounts for 4.8% of GDP.

Table 2.27: North American telecommunication service providers operating in different markets

Telecommunication service provider	Number of markets/countries
Verizon	150
AT&T	190

Table 2.28: 2020 North America's most valuable telecommunication service provider brands

Position in North America	Telecommunication service provider	Country	Position globally
1	Verizon	United States of America	1
2	AT&T	United States of America	2
3	Xfinity	United States of America	6
4	Spectrum	United States of America	8

2.11 Structural Equation Modelling (SEM)

SEM helps in the assessment of relationships among variables and is based on principles of multiple regression and factor analysis (Fahr, 2008). SEMs are multivariate because they include a multi-equation regression model (Fox, 2002). SEM analysis involves observed variables and latent variables. Observed variables are variables with a numeric response to a rating scale format like age, height, etc. and are ordinarily continuous. Latent variables are variables that cannot be directly observed, because their value cannot be measured numerically, like commitment, satisfaction, etc. (Fahr, 2008).

2.11.1.1 Linear regression

Linear regression is commonly used for predictive analysis by explaining relationships between the dependent variable and independent variable. For example, for the Equation **Y = a +bX** where **Y** is the dependent variable, **a** is the Y-intercept, **X** is the independent variable and **b** is the slope (Hangtwenty, 2018)

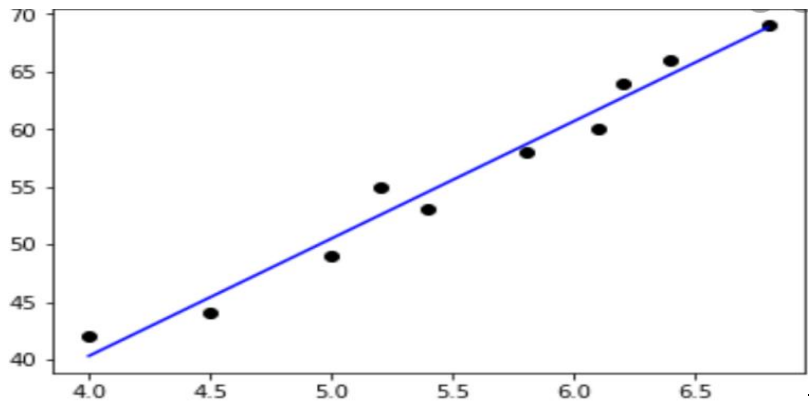

Figure 2.2: Example of linear regression

2.11.1.2 Logistic regression

A classification algorithm is used in categorical response variables and to find relationships between probability and features of a particular desired outcome (Hangtwenty, 2018).

Formula - $\frac{p}{1-p} = \exp(b_0 + b_1 x)$ where p is the probability of success, 1 – p is the probability of failure.

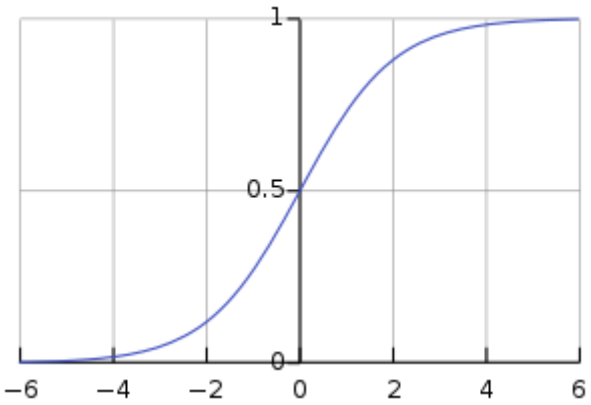

Figure 2.3: Example of logistic regression

2.11.2 SEM Methods

Auxiliary Theory (AT) is a process of mapping theoretical constructs into an empirical situation which is observed without being open to more questions (Urbach & Ahlemann, 2010)

Partial Least Squares (PLS) is a method of constructing predictive models in which have more than one factor and are highly collinear (Kante et al., 2018; Urbach & Ahlemann, 2010). PLS is very useful when there is no limit to the number of measured factors and when the goal is making a prediction. PLS and Principal Component Regression can handle a significant number of correlated independent variables (Ng, 2013).

2.11.3 SEM Constructs

Formative constructs are defined by causality flow from indicators to the construct (Roni et al., 2015). Reflective Constructs are common latent factors with reflective indicators whereby their underlying latent structure is reflected by changes in their indicators (Bankole & Bankole, 2017). Kante et al. (2018) and Urbach & Ahlemann (2010) state that the Partial Least Square Structural Equation Model (PLS-SEM) is the most widely used technique for information systems research and regular quantitative data analysis for the following reasons:

- PLS does not have as many demands concerning sample size as other methods.
- PLS does not need normal-distributed input.
- PLS can be applied to complex equation models with large number of constructs.
- PLS can handle both reflective and formative constructs.
- PLS is better suited for theoretical development than for the testing of a theory.

PLS is particularly useful for prediction.

2.12 Machine Learning (ML)

Machine Learning is an area of artificial intelligence that allows a computer system to learn from experience by the use of data algorithms (Dhanda et al., 2019). ML is used to solve real-life problems and for experimental work (Anifowose et al., 2016). ML is the science of developing computers to learn and behave like humans (Hangtwenty, 2018).

2.12.1 Types of machine learning

Types of machine learning (Hangtwenty, 2018)

Table 2.29: ML types, Algorithms and Application

Type	Explanation	Algorithms	Application
Supervised Machine Learning (SML)	The algorithm has a target outcome variable. Both input and desired output data is given. The training of the model is continuous until the model achieves a desired level of accuracy from the training data.	Linear regression. Logistic regression. Support Vector Machines Naïve Bayes. K-nearest neighbour algorithm. Random Forest Algorithm.	Quantitative structure. Bioinformatics. Learn to rank. Information extraction. Object recognition. Pattern recognition.
Unsupervised Machine Learning (UNL)	It is used on information that is neither classified nor labelled. Acts without guidance. It works with large volumes of varied data.	K-means algorithm. Principal Component Analysis (PCA). Expectation-maximization algorithm (EM)	Human behaviour analysis. Social network analysis. Market segmentation.

	The machine must be programmed to begin learning.		
Reinforcement Machine Learning (RML)	Works within a specific context. Automatically sets exemplary behaviour in a particular context to maximize performance. It focuses on performance.	Q-Learning algorithm. Deep Q Network algorithm. State-action-reward-state-action algorithm.	Deep learning. Robotics. Traffic light control. Resource management in computer clusters.

Alzubi et al. (2018) add more types of ML as follows:

Table 2.30: Machine learning types

Type	Explanation
Evolutionary machine learning	It proposes the best solution to the problem. The algorithms understand and adapt to the behaviour of the inputs and rule out unlikely solutions.
Semi-supervised learning	It harnesses the power of supervised and unsupervised learning techniques.
Ensemble learning	It is a model with numerous individual models trained to solve a common problem.
Artificial Neural Network	Symbolizes a biological neural network by having interconnected neural cells that take part in solving a problem.
Instance-based machine learning	Referred to as a lazy learner because it does not describe any target function when started, it stores the training instance and postpones generalization until a newer instance is classified.

2.12.2 Algorithms

Algorithms are based on the type of problem to be solved. Factors for selecting a particular algorithm model (Dhanda et al., 2019):

Table 2.31: Factors for selecting an algorithm model

Algorithm	Explanation
Parametrization	Parameters are key to ML Learns from historical training data Classified as: a) no parameters b) weal c) simple/intuitive d) no intuitive
Memory size	It is the space needed to store data and variables. Classified as: a) small b) large c) very large
Type of algorithm	1. Regression, a technique used for the prediction of dependent variables in a set of independent variables. Algorithms under regression: a) Linear regression b) decision tree c) random forest d) boosting 2. Classification, a technique used for approximation on mapping functions (*f*) from input variable (*x*) to discrete output (*y*). Algorithms fall under classifications: a) logistic regression b) naïve Bayes c) support vector machine (SVM) d) neural networks e) decision tree f) random forest g) boosting. 3. Clustering, a technique for dividing data points or populations into several groups.
Time of learning	Time is taken to learn using the given dataset. This is influenced by the volume of data and the algorithm chosen. Time is classified by: a) weak b) costly c) very costly
Time of predicting	Time is taken to make predictions from the dataset and is influenced by the volume of data and the algorithm chosen, it is classified as either: a) weak b) costly based on the time taken to classify it.
Overfitting tendency	Overfitting tendency is the result of an overly complicated model with many parameters, it is the type that tries to predict trends in data that is too noisy. It is classified as a) low b) average c) high d) very high

2.12.3 A general model of machine learning

A generic model of machine learning (Alzubi, Nayyar, & Kumar, 2018)

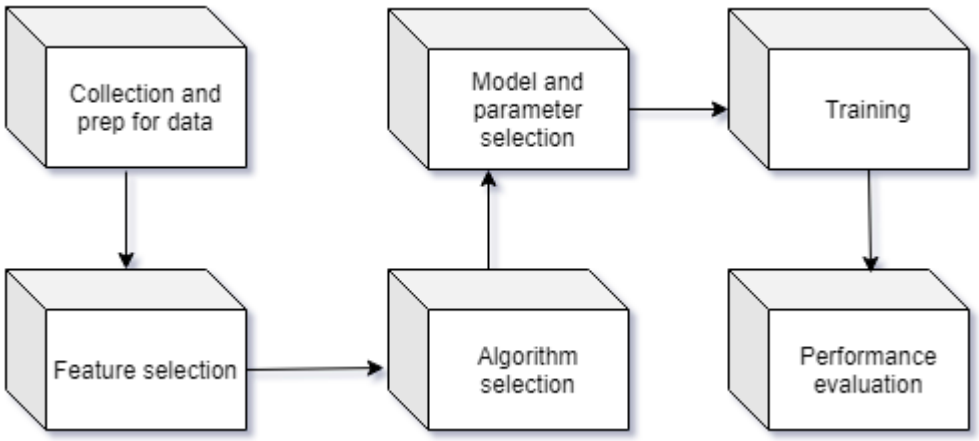

Figure 2.4: Generic machine learning model

2.13 Summary

A brand can be any symbol or writing or art. This symbol, writing or art is what is used to differentiate the goods of one maker from that of another. A brand can serve as a function to achieve a specific purpose. This brand function can be what a brand stands for. A corporate image is a perception of what the organisation stands for in its customers' minds. This image is often what the organisation sends out to its stakeholders as a means of marketing and also represents what the organisation stands for. Brand loyalty on customers can be achieved through customers remaining with the brand and or customers recommending products or service of the brand to others. Loyalty programs are employed to retain customers by giving them some form of brand equity. A telecommunication provider can be an MNO and/or MVNO. The telecommunication industry is very competitive, service providers offer different packages for data, voice, text, fixed-wire, wireless and handsets. These packages are meant to lure new customers and also to retain existing customers. Multiple factors influence the retention and attraction of customers. Having a high subscriber base doesn't result in high revenues as revenues depend on customer's spending.

CHAPTER 3
Research Design and Methodology

3.1 Introduction

This chapter explains how the study was developed and the methods used. These include:

- The research paradigm
- Approach to theory
- Data collection
- Research population
- Research methodology

3.2 Research paradigm

There are three research epistemological assumptions in information systems as outlined by (Myers, 1997; Orlikowski & Baroudi, 1991):

i. Positivist
   - Reality is objective
   - Properties are measurable
   - The aim is to validate the theory

ii. Interpretive
   - Reality can be achieved through social constructs such as mutual meanings, consciousness, language, and instruments.
   - Social reality is based on the past, and it is created and recreated further by people.

iii. Critical
   - Scrutiny of current social conditions impedes the recognition of freedom, emancipation, and justice.

This research makes use of realistic measurable properties in the form of a survey questionnaire, with specific questions to examine certain dimensions of the constructs/variables found in the conceptual model. Secondly, the research is conducted through an anonymous online survey, and lastly, the research seeks to validate a theory that is set out in a group of hypotheses.

3.3 Approach to Theory

This research employs an exploratory approach to theory since literature references already exist for some of the hypotheses. Hu et al. (2009) and Lai et al. (2009) have previously tested

some of the hypotheses, however, without the dimensions of culture and brand function in Africa, Europe, and North America. This study alters the existing conceptual models and adds these two dimensions to examine relationships for loyalty.

Information Systems (IS) has two research techniques Quantitative and Qualitative (Jick, 1979). This research uses the quantitative method in gathering data and analysis.

3.4 Research Population

The research was aimed at persons over the age of 18 in Africa, Europe, and North America who are users of telecommunication service providers. The research aimed at collecting 1050 responses, at approximately 350 for Africa, 350 for Europe, and 350 for North America. The reason for targeting of 350 responses per continent is because structural equation modelling has proven to work on a minimum set of 150 entries/responses (Muthén & Muthen, 2002). Therefore, a target of 350 is well above the minimum entries/responses and therefore the modelling should yield accurate results.

The survey was sent out online with no bias or targeting of specific regions, ethnic groups, or countries, and it was aimed at each continent. Only top mobile operators of those continents were available for selection. However, the "Other" option was included for any unlisted mobile operator for each continent. This "Other" is a text field in which the participants can enter the name of their mobile operator on the survey.

3.5 Data Collection

The research used an anonymous survey to collect behavioural data from participants from three continents. The survey was created on an online platform called Survey Monkey and was distributed via their channels. The same link to the survey was distributed both on social media platforms and by email. No physical face to face interviews for answering the survey questionnaire was conducted, all data from the survey was obtained online from the Survey Monkey platform used. The survey was run for a period of four months from April 2020 to July 2020.

Survey Monkey platform collects survey data randomly by the following steps (SurveyMonkey, 2021):

1. Persons are chosen randomly to participate in the survey.

2. Their platform adjusts the data to represent the sample population by using advanced statistical inferences for balancing.

3.5.1 Questionnaire Design

The survey was conducted via a list of questions. The questions are taken from existing literature. The questions are designed to evaluate voice, data, coverage, customer service, perception, loyalty and cost on the following constructs:

Table 3.1: Questionaire design

Variable / Construct	Explanation	Dimension to be measured/examined
Brand Function	The brand function had two questions that evaluated the kind of relationship which exist between a telecommunication service provider and consumer and also the practicality of mobile services to consumers.	Symbolic function. Relationship function.
Service Quality	Service quality had six questions that evaluated quality of coverage, quality of response from a telecommunication service provider for fault resolution, the quality of delivery of mobile services and the overall service received from the telecommunication service provider.	Brand as service provider. Brand Performance. Service Quality. Service Performance.
Perceived Value	Value had two questions that evaluated how customers are proud of their telecommunications service provider and if the services received are worth their time.	Emotive Value. Social Value. Perceived Value.
Customer Satisfaction	Customer satisfaction had six questions that evaluated how the customer feels (confidence and dignity) about the services, suitability of services offered, the type of experience and the overall satisfaction of the customer from the telecommunication service provider.	Brand Association. Brand Judgement. Brand Resonance. Brand Equity.

Corporate Image	The corporate image had five questions that evaluated, uniqueness of the telecommunications service provider, the position of a telecommunication service provider in the mind of customers, reputation and prestige of the telecommunication service provider.	Brand Identity. Brand Image. Brand Reputation. Brand Prestige. Brand Salience.
Culture	Culture had thirteen questions that evaluated the national culture dimension of individualism, power distance, uncertainty avoidance and masculinity from customers.	Individualism. Uncertainty Avoidance. Masculinity/Femininity. Power Distance.
Loyalty	Brand loyalty had two questions that evaluated the likelihood of the customer recommending services of the telecommunication service provider and the customer being likely to switch to another telecommunication service provider.	Repurchase behaviour. Willingness to recommend.

3.5.2 Questionnaire format

The questionnaire was divided into two sections:

i. Demographic data

- Answers to questions concerning employment status, gender, continent, mobile operators, were collected through multiple choice of only one selection.
- Answers to questions concerning the number of years using mobile operators were provided through numerical ranges for a single selection.

ii. Selection response

- A three-point Likert scale was provided for responses to statements that required a single selection from (Agree), (Neither Agree Nor Disagree) or (Disagree).

3.5.3 Questionnaire Limitations

The questionnaire may not have included all the questions that could have been used to measure each construct, as each construct examined is broad in the literature.

3.5.4 Assumptions to Questionnaire Design

The main assumptions of the questions are as follows:

i. Participants are of legal age on each continent
ii. Participants are actual users of telecommunication services and products
iii. Participants are actual human beings and not robots

3.6 Research methodology

The research employed a quantitative method using a structural equation model and machine learning.

3.6.1 Quantitative research

Quantitative research deals with data that can be converted to numbers for statistical purposes. The quantitative method is excellent when collecting data that will be used to get to a conclusion. It is also helpfully in narrowing down a path leading to a possible direction that the research can take. This method offers the benefits of being able to finalise results to prove a hypothesis, it also helps to filter external factors so that the results cannot be biased (Jick, 1979). Quantitative method (Celano, 2014):

Table 3.2: Quantitative method

Area	Explanation
Type of Knowledge	The method is objective
Nature of Data	The method uses numbers, statistics and replication
Aim	The method can generalize and can test
Characteristics	The method can be fixed. The method can be controlled. Independent and dependent variables can be tested. Pre and post-measurement of change can be tested.
Analysis	The method is statistical
Sampling	The method can use randomization
Data Collection	The method is structured in how it collects data.

Table 3.3: Advantages and Disadvantages of Quantitative

Scholars	Advantages	Disadvantages
(Jick, 1979) (Psychology & Muller, 2014)	The method is good for analysing data. The method is good for measuring data. The method can be used to test a hypothesis. Independent relationships can be measured in detail using this method.	This method also has a disadvantage of making researches long and expensive, it also has tendencies of giving results that have been proven or unproven. A large crowd/survey has to be carried out, the larger the survey the more accurate the results will be. This method does not study things in a natural setting.

The research used quantitative methodology based on the advantages listed in table 3.3.

3.7 Analysis of data

The information gathered on the online surveys was exported per continent into Microsoft Excel and labelled according to the continent and further exported in full and labelled as "Combined". The survey data was also analysed using the Survey Monkey platform for demographic observations.

3.8 Justification for SEM and ML

SEM is used to examine the relationship between the constructs/variables as per the conceptual model. Once the relationships are validated to have a significate positive effect on each other as per the conceptual model, the survey data will be inserted into a supervised ML to evaluate which ML algorithm can make a better prediction on the two loyalty columns. This two-step approach of SEM and ML was used by (Al-Skaf et al., 2021) in a study of 350 surveyed pupils examining the pupil's acceptance of social media in education along with its factors. Al-Skaf et al. (2021) used SEM to evaluate the theoretical model while ML is used to reinforce the theoretical model developed and making predictions based on the collected survey data. In another study by Shi et al (2018) SEM and ML algorithm, Random Forest was used for evaluating the main contributing factors on vegetation carbon stocks, direct and indirect total

effects of the main deriving factors on above-ground carbon stocks and changes in standardized effects from 2004 to 2014.

3.9 Conceptual Model

The study by Lai et al. (2009) has shown that loyalty could be achieved in a telecommunication organisation by testing relationships between quality, value, satisfaction, image and loyalty. The conceptual model was drawn from this study but modified with the inclusion of brand function and culture for testing relationships in Africa, Europe, and North America.

Venetis & Ghauri (2004) and Tsoukatos (2007) have conducted studies on service quality and customer retention, and have found that service quality has a significant positive effect on customer retention, and customer retention is loyalty. Hew et al. (2017) have examined the relationship which exists between brand attachment (a loyalty status) to smartphone repurchase and found brand attachment to have a significant positive influence on the repurchase of the same brand of smartphones.

Hopkins et al. (2009) have found that service script will be effective if there are no cultural differences between service employees and customers. Hu et al. (2009) have focused on quality, perceived value, corporate image, and customer satisfaction. Their study concludes that:

i. Service quality, perceived value and customer satisfaction are statistically significant by having a positive impact.
ii. Service quality, perceived value, customer, satisfaction and corporate image are statistically significant by having a positive effect.
iii. Service quality, perceived value, corporate image, and behavioural intentions have a positive impact as service quality and behavioural intentions are not significant.

The study has revealed that service quality has an indirect effect on behaviour through satisfaction and corporate image. Lam (2007) has found that individuals who score high as individualists are likely to switch brands, in his examination of the effects of culture on brand loyalty. Gantsho & Sukdeo (2018) have focused on culture and service quality and concluded that culture has a positive effect on service quality. These works of literature are used in formulating the conceptual model as follows:

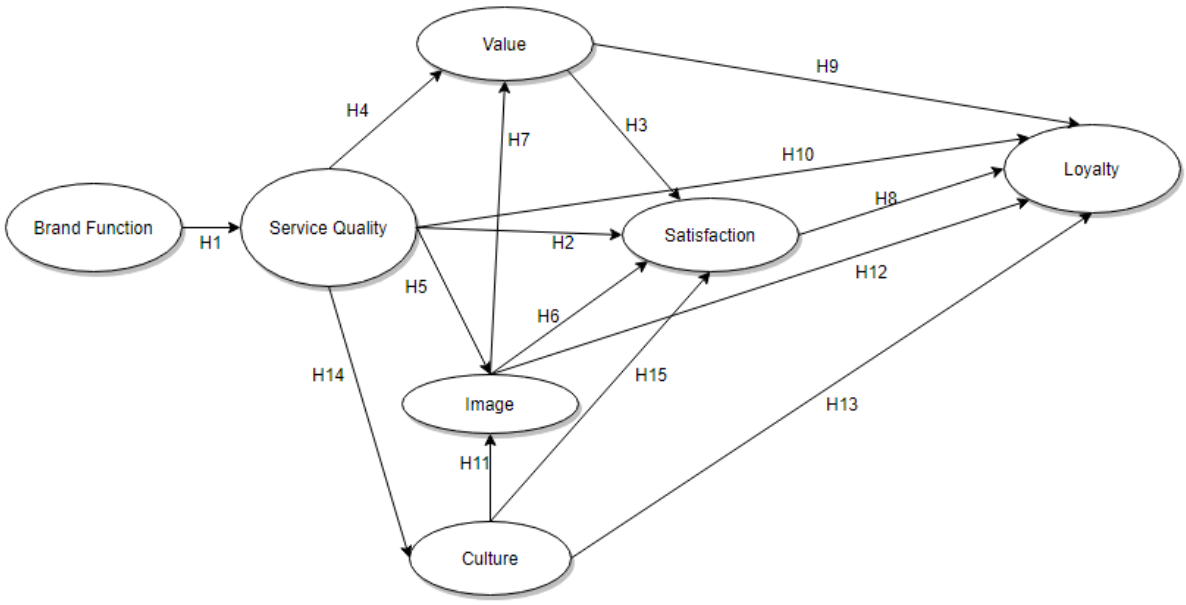

Figure 3.1: Conceptual Model

3.9.1 Hypothesis development

H1. A brand function has a significant, positive effect on service quality.

A brand function illustrates the nature of the product or service or the experience type or brand provided benefits. At the same time, the descriptive modifier distinguishes the nature of the product or service (Franzen & Sandra, 2008). Brands are built based on a product, at the same time brands serve multiple purposes for an organization with their basic level being a marketer for their organization. As for the customer, brands offer them simplicity in making a choice and the ability to reduce risk by purchasing a product of a certain quality and trust (Keller & Lehmann, 2006). A brand function is measurable on a profile of multiple attributes or characteristics; therefore, it is defined as the perception of the ability to utilize a product or service based on its physical or non-physical performance. It is the determination of needs and/or wants that the brand must satisfy for its customers. It also identifies functions that the brand should fulfil in the lives of its customers and consumers and the values that the brand should upload.

H2. Service quality has a significant, positive effect on customer satisfaction.

Perceived quality and perceived value are the top two determinants of customer satisfaction (Fornell, Johnson, Anderson, Cha, & Bryant, 1996)

H3. Perceived value has a significant, positive effect on customer satisfaction.

Perceived quality and perceived value are the top two determinants of customer satisfaction (Fornell et al., 1996) Perceived value is positively influenced by perceived value where else price will influence value negatively Lai et al. (2009)

H4. Service quality has a significant, positive effect on perceived value.

A studies by (Hapsari et al., 2016; Lin & Huang, 2018) has found that the more a customer has a perception of good quality service the more the customer will perceive value from the corporate. When the customer gets good quality service, it enhances their perception of benefits received. Perceived quality is the perception which the customer or consumer has about the product or service in comparison to other products, and this is the belief of the customer or consumer about the product or service. Moreover, this belief influences the customer or consumer's attitude towards the brand. Perceived quality and product quality are two separate constructs; the first is based on the customer, while the latter is based on product build quality which depends on the functionality of the product, ease of use and ease of maintenance (Zimmer & Kapferer, 2013).

H5. Service quality has a significant, positive effect on corporate image.

A customer's evaluation of service quality, value, and satisfaction can be drawn from the corporate image portrait drawn by the corporate. This image creates a void of satisfaction which the service quality will full fill once the customer experiences good service quality (Hu et al., 2009; Lai et al., 2009).

A relationship exists between previewed value, service quality, corporate image, customer satisfaction, and customer loyalty. The general cohort theory suggests that contextual social and economic backgrounds influence the values, attitudes, and behaviour of people of the same generation (Lin & Huang, 2018).

H6. A corporate image has a significant, positive effect on customer satisfaction.

A positive image contributes to a good experience while consuming the service or product and makes it more pleasurable socially and emotionally Lai et al. (2009). Zimmer & Kapferer (2013) state that the favourability of brand association is achieved by persuading the consumers or customers that the product or its attributes are relevant. Furthermore, its benefits are satisfying to customer needs and bring customers peace of mind and joy.

H7. A corporate image has a significant, positive effect on perceived value.

Brand attributes are descriptive features that characterize a product or branded service, while brand benefits have personal value and meaning which customers are attached to when they consider the product or branded service (Zimmer & Kapferer, 2013).

Quality, value, and satisfaction can directly lead to customer loyalty (Hu et al., 2009; Lai et al., 2009), thus:

H8. Customer satisfaction has a significant, positive effect on loyalty.
H9. Perceived value has a significant, positive effect on loyalty.
H10. Service quality has a significant, positive effect on loyalty.

H11. Culture has a significant, positive effect on corporate image.

Branding is not only physical but corporate culture can also be seen as branding; how a corporate brand itself internally through its culture and how it portrays that culture externally to set it apart from other companies, is considered as branding (Preskar & Žižek, 2019).

H12. A corporate image has a significant, positive effect on customer loyalty.

Brand architecture maximizes the transfer of equity throughout the brand and its individual products and services, to improve the process of trial and repeat purchase (Zimmer & Kapferer, 2013).

H13. Culture has a significant, positive effect on customer loyalty.

Culture can have a significant influence on an individual's thinking and behaviour, individuals with high individualism are less prone to switching brand (Lam, 2007).

H14. Service quality has a significant, positive effect on culture.

There exists an important relationship between culture and service quality (Gantsho & Sukdeo, 2018).

H15. Culture has a significant, positive effect on customer satisfaction.

(Hopkins et al., 2009) suggest that when culture is an important matter, it may interfere with service scripts which play an important role in determining customer satisfaction and the overall service experience.

3.10 Validation of Instruments

The questionnaire was taken to be valid. The reason for this assertion is because the questions were taken from studies already conducted in the past by other scholars, in particular the study by (Lai et al., 2009) which is the foundation of this study and other studies used in formulating the conceptual model in section 3.8.

3.11 Ethical Issues

Initially, it was not mandatory to have an answer for every question. This was later corrected so that every question/statement needed a response. This was necessary otherwise the responses would have distorted the data because there would have been missing values. The final list of questions for the survey was then sent to the researcher's supervisor for approval and approval was received. The UNISA College of science, engineering, and technology's (CSET) research and ethics committee issued a clearance, as per Appendix A.

3.12 Summary of the Research Process

The research followed these approaches, as illustrated.

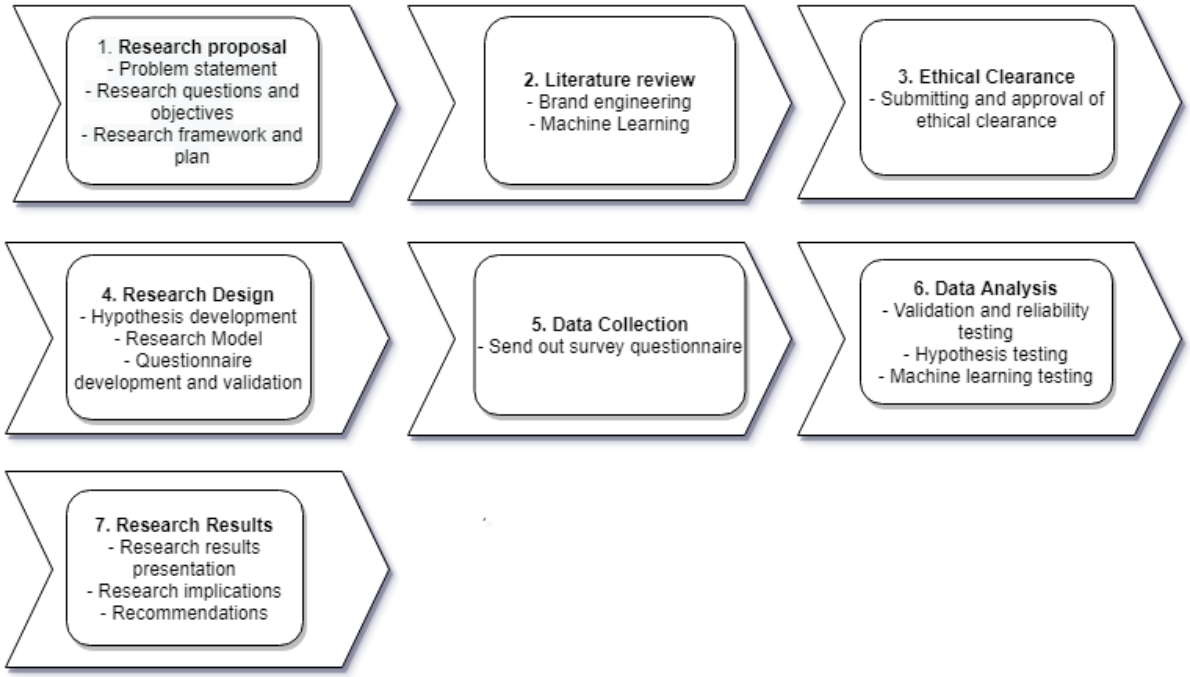

Figure 3.2: Research process

3.13 Summary

A conceptual model, as adopted from previous studies, was developed. However, the previous study's models were amended to include new factors in the form of constructs. This conceptual model leads to the development of 15 hypotheses which were to be tested by the research. UNISA granted ethical clearance before the research was conducted. The research adopted an exploratory approach by collecting data in the form of a survey. The collection of survey data dictated that the study would use a quantitative method. The survey questions/hypotheses were adapted from previous studies that tested similar concepts. The research was limited to persons over the age of 18 who had experience using mobile services and or products. The results of the survey were collected from anonymous participants from Africa, Europe and North America.

CHAPTER 4
Data analysis

4.1 Introduction

In this chapter, a comparative analysis is done on demographic data from the three continents. The demographic data are comprised of the Continent, Mobile operator, Age group, Gender, Occupation Level, and Experience using mobile telecommunication.

4.2 Demographic Analysis

A total of 971 responses to the survey were accepted and used, after those which had missing sections had been excluded. 'Combined' refers to all data of the three continents.

Table 4.1: Survey responses per continent

Africa	Europe	North America	Combined
343 *(35.32%)*	421 *(43.35%)*	207 *(21.33%)*	971 *(100%)*

4.2.1.1 Gender Distribution

Table 4.2: Gender distribution

Gender	Africa	Europe	North America	Combined
Male	149	204	127	480
Female	189	212	76	477
Other	5	5	4	14

4.2.1.2 Age Group Distribution

Table 4.3: Age group distribution

Age Group	Africa	Europe	North America	Combined
18 – 25	79	114	71	264
26 – 33	119	134	69	322
34 – 41	63	83	29	175
42 – 49	38	51	17	106
50+	44	37	20	101

Other		2	1	3

4.2.1.3 Experience using telecommunication services Distribution

Table 4.4: Experience using telecommunications distribution

Experience	Africa	Europe	North America	Combined
Less than 1 year	13	43	24	80
Between 1 and 2 years	13	68	40	121
Between 2 and 5 years	65	75	56	196
Between 5 and 10 years	74	96	34	204
More than 10 years	178	139	53	370

4.2.1.4 Occupation Level Distribution

Table 4.5: Occupation level distribution

Occupation	Africa	Europe	North America	Combined
Employed	222	264	101	587
Unemployed	97	103	80	280
Other	24	54	26	104

4.2.1.5 Mobile Operator Distribution

Table 4.6: Mobile Operator distribution

Operator	Responses
AT & T mobility	61
BT (UK)	33
Maroc Telecom	1
MegaFon	51
MTN	154
Orange	46
Orange (France)	14
Orascom Telecom	1
Other(Not listed)	121
Rostelecom	24

Safaricom	9
Sprint Corporation	32
Telecom Italia (Italy)	12
Telkom	62
T-Mobile US	78
Verizon Wireless	71
Vodacom	135
Vodafone (UK)	66

4.3 Methodological rigour and self-assessment

In this quantitative research, the researcher achieved precision by employing the following:

4.3.1 Planning

By using existing literature for guidance on what is the best methodology for this kind of research, and by choosing the best form of hypothesis testing according to the existing body of knowledge.

4.3.2 Data collection and reliability

A survey was used to collect responses from participants, which meant that there was no bias or undue influence by the researcher on the participants—using questions in the survey which were already available in similar studies. This meant that the researcher formulated no new questions. The reliability of the data was assessed using 'Cronbach alpha' a well-known measure for testing data reliability.

4.3.3 Analysis

Analysis was carried out using methods for testing hypotheses (SEM) that were already known from existing studies, using well-known software (Microsoft Excel, WarpPLS, and Rapid Miner). Other analysis techniques from the existing literature, like regression and prediction modelling algorithms, were also used.

4.4 PLS Regression Analysis and hypothesis testing

PLS regression is employed to examine the data per continent for testing each hypothesis and also on the combined data. The PLS regression is conducted using the WarpPLS software.

4.5 Construct Validity and Reliability Testing

Construct validation is conducted by exploratory factor analysis using WarpPLS 7.0 while construct reliability is conducted using Cronbach Alpha efficiency testing. A Cronbach Alpha value of 0.7 and higher represents good reliability.

4.5.1 Africa

Africa's Cronbach Alpha from 343 responses.

Table 4.7: Africa's Cronbach Alpha

Image	Function	ServQual	Satisfaction	Value	Culture	Loyalty
0.760	0.728	0.880	0.883	0.739	0.818	0.789

4.5.2 Europe

Europe's Cronbach Alpha from 421 response

Table 4.8: Europe's Cronbach Alpha

Image	Function	ServQual	Satisfaction	Value	Culture	Loyalty
0.728	0.706	0.818	0.815	0.718	0.852	0.710

4.5.3 North America

North America's Cronbach Alpha from 207 response

Table 4.9: North America Cronbach Alpha

Image	Function	ServQual	Satisfaction	Value	Culture	Loyalty
0.742	0.743	0.706	0.718	0.709	0.827	0.756

4.5.4 All Combined

Africa, Europe and North America's Cronbach Alpha from 971 response

Table 4.10: Combined Cronbach Alpha

Image	Function	ServQual	Satisfaction	Value	Culture	Loyalty
0.740	0.716	0.836	0.843	0.726	0.837	0.766

4.6 Regression analysis and hypothesis testing

4.6.1 Africa

A total of 500 responses was received. After those with missing values were removed 343 responses were used. The data showed good reliability with a Cronbach alpha loading of more than 0.7, which is acceptable. The model was tested for fitness and quality with Average path

coefficient (APC) = 0.322, p<0.001 and Average R-squared (ARS) = 0.556, p<0.001 and Average adjusted R-squared (AARS) = 0.553, P<0.001 and Average block VIF (AVIF) = 2.402 which is acceptable if ≤ 5 and ideally ≤ 3.3. Average block VIF (AVIF) = 2.402 which is acceptable if ≤ 5 and ideally ≤ 3.3 and Average full collinearity VIF (AFVIF) = 3.192 which is acceptable if ≤ 5 and ideally ≤ 3.3.

*p<0.05; **p<0.01; ***p<0.001

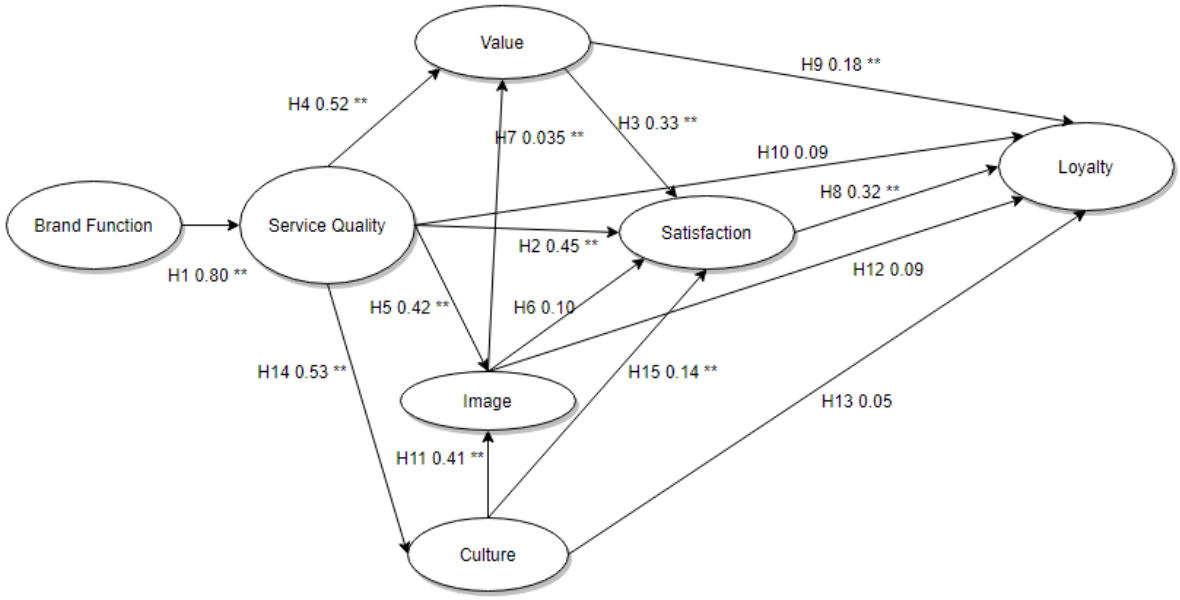

Figure 4.1: Africa SEM results

Results of hypothesis testing (Significant at p < 0.05 and highly significant at p < 0.01)

Table 4.11: Africa hypothesis testing results

Hypothesis	β Value	p-Value	Remark
H1. A brand function has a significant, positive effect on service quality.	0.80	p<0.01	Validated
H2. Service quality has a significant, positive effect on customer satisfaction.	0.45	p<0.01	Validated
H3. Perceived value has a significant, positive effect on customer satisfaction.	0.33	p<0.01	Validated
H4. Service quality has a significant, positive effect on perceived value.	0.52	p<0.01	Validated
H5. Service quality has a significant, positive effect on corporate image.	0.42	p<0.01	Validated

H6. A corporate image has a significant, positive effect on customer satisfaction.	0.10	p=0.03	Not Validated
H7. A corporate image has a significant, positive effect on perceived value.	0.35	p<0.01	Validated
H8. Customer satisfaction has a significant, positive effect on loyalty.	0.32	p<0.01	Validated
H9. Perceived value has a significant, positive effect on loyalty.	0.18	p<0.01	Validated
H10. Service quality has a significant, positive effect on loyalty.	0.09	p=0.05	Not Validated
H11. Culture has a significant, positive effect on corporate image.	0.41	p<0.01	Validated
H12. A corporate image has a significant, positive effect on customer loyalty.	0.09	p=0.05	Not Validated
H13. Culture has a significant, positive effect on customer loyalty.	0.05	p=0.17	Not Validated
H14 Service quality has a significant, positive effect on culture.	0.53	p<0.01	Validated
H15. Culture has a significant, positive effect on customer satisfaction.	0.14	p<0.01	Validated

Eleven hypotheses tested true (Validated) while four tested negative (Not Validated) with p values outside the significant range. This represents a 73% validation of the 15 hypotheses tested.

Table 4.12: Africa - Effective sizes for path coefficients

	Image	Function	ServQual	Satisfaction	Value	Culture	Loyalty
Image			<0.001			<0.001	
ServQual		<0.001					
Satisfaction	0.034		<0.001		<0.001	0.004	
Value	<0.001		<0.001				
Culture			<0.001				
Loyalty	0.005		0.001	<0.001	<0.001	0.020	

4.6.2 Europe

A total of 421 responses was received. The data showed good reliability with a Cronbach alpha loading of more than 0.7, which is acceptable. The model was tested for fitness and quality with APC = 0.310, p<0.001 and ARS = 0.498, p<0.001 and AARS = 0.495, p<0.001 and AVIF

= 2.178 which is acceptable if ≤5 and ideally ≤ 3.3. AVIF = 2.598 which is acceptable if ≤ 5 and ideally ≤ 3.3 and AFVIF = 3.192 which is acceptable if ≤ 5 and ideally ≤ 3.3.

*p<0.05; **p<0.01; ***p<0.001

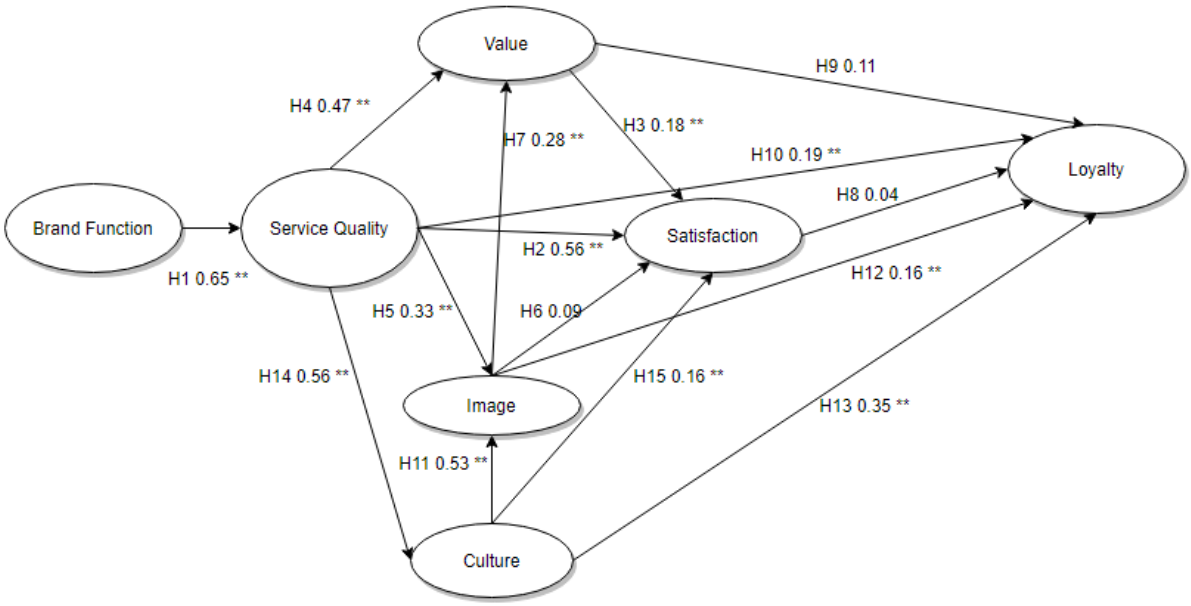

Figure 4.2: Europe SEM results

Results of hypothesis testing (Significant at p < 0.05 and highly significant at p < 0.01)

Table 4.13: Europe hypothesis testing results

Hypothesis	β Value	p-Value	Remark
H1. A brand function has a significant, positive effect on service quality.	0.65	p<0.01	Validated
H2. Service quality has a significant, positive effect on customer satisfaction.	0.56	p<0.01	Validated
H3. Perceived value has a significant, positive effect on customer satisfaction.	0.18	p<0.01	Validated
H4. Service quality has a significant, positive effect on perceived value.	0.47	p<0.01	Validated
H5. Service quality has a significant, positive effect on corporate image.	0.33	p<0.01	Validated
H6. A corporate image has a significant, positive effect on customer satisfaction.	0.09	p=0.04	Validate
H7. A corporate image has a significant, positive effect on perceived value.	0.28	p<0.01	Validated

H8. Customer satisfaction has a significant, positive effect on loyalty.	0.04	p=0.21	Not Validated
H9. Perceived value has a significant, positive effect on loyalty.	0.11	p=0.01	Not Validated
H10. Service quality has a significant, positive effect on loyalty.	0.19	p<0.01	Validated
H11. Culture has a significant, positive effect on corporate image.	0.53	p<0.01	Validated
H12. A corporate image has a significant, positive effect on customer loyalty.	0.16	p<0.01	Validated
H13. Culture has a significant, positive effect on customer loyalty.	0.35	p<0.01	Validated
H14 Service quality has a significant, positive effect on culture.	0.56	p<0.01	Validated
H15. Culture has a significant, positive effect on customer satisfaction.	0.16	p<0.01	Validated

13 hypotheses tested true while two tested negatives with p values outside the significant range. This represents an 86% validation of the 15 hypotheses.

Table 4.14: Europe - Effective sizes for path coefficients

	Image	Function	Satisfaction	ServQual	Value	Culture	Loyalty
Image				0.207		0.375	
Satisfaction	0.056			0.457	0.12	0.103	
ServQual		0.418					
Value	0.161			0.302			
Culture				0.309			
Loyalty	0.091		0.020	0.098	0.054	0.215	

4.6.3 North America

A total of 207 responses was received. The data showed good reliability with a Cronbach alpha loading of more than 0.7, which is acceptable. The model was tested for fitness and quality with APC = 0.297, p<0.001 and ARS = 0.426, p<0.001. AARS = 0.419, p<0.001 and AVIF =1.684 which is acceptable if ≤ 5 and ideally ≤ 3.3 and AFVIF = 2.108 which is acceptable if ≤ 5 and ideally ≤ 3.3.

*p<0.05; **p<0.01; ***p<0.001

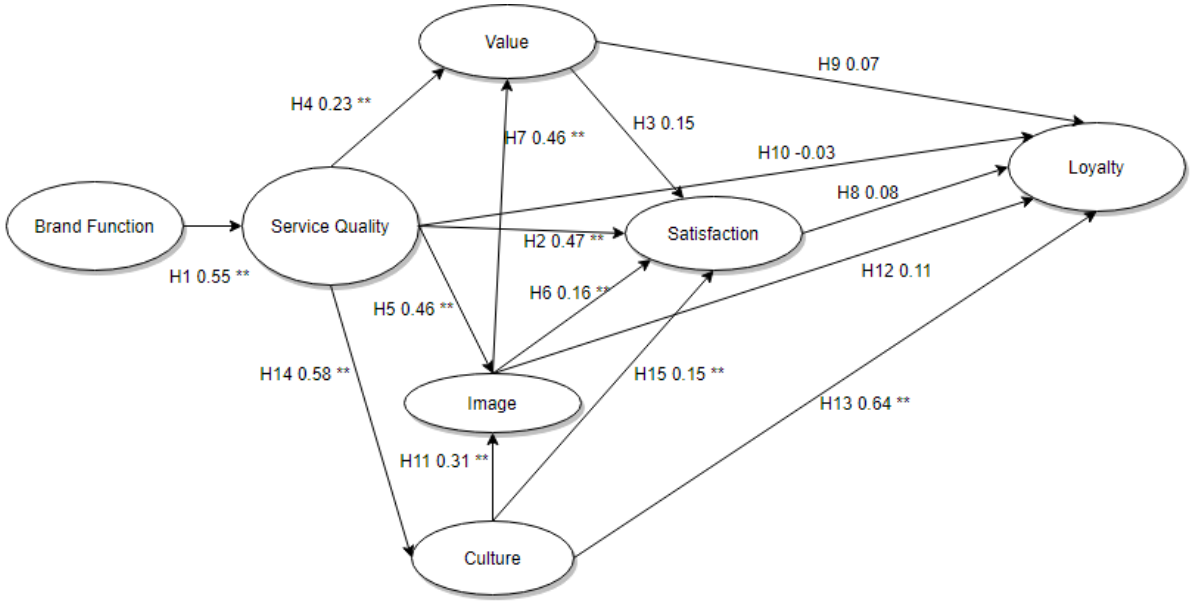

Figure 4.3: North America SEM results

Results of hypothesis testing (Significant at $p < 0.05$ and highly significant at $p < 0.01$)

Table 4.15: North America hypothesis testing results

Hypothesis	β Value	p-Value	Remark
H1. A brand function has a significant, positive effect on service quality.	0.55	p<0.01	Validated
H2. Service quality has a significant, positive effect on customer satisfaction.	0.47	p<0.01	Validated
H3. Perceived value has a significant, positive effect on customer satisfaction.	0.15	p=0.01	Not Validated
H4. Service quality has a significant, positive effect on perceived value.	0.23	p<0.01	Validated
H5. Service quality has a significant, positive effect on corporate image.	0.46	p<0.01	Validated
H6. A corporate image has a significant, positive effect on customer satisfaction.	0.16	p<0.01	Validated
H7. A corporate image has a significant, positive effect on perceived value.	0.46	p<0.01	Validated
H8. Customer satisfaction has a significant, positive effect on loyalty.	0.08	p=0.11	Not Validated

H9. Perceived value has a significant, positive effect on loyalty.	0.07	p=0.14	Not Validated
H10. Service quality has a significant, positive effect on loyalty.	-0.03	p=0.33	Not Validated
H11. Culture has a significant, positive effect on corporate image.	0.31	p<0.01	Validated
H12. A corporate image has a significant, positive effect on customer loyalty.	0.11	p=0.06	Not Validated
H13. Culture has a significant, positive effect on customer loyalty.	0.64	p<0.01	Validated
H14 Service quality has a significant, positive effect on culture.	0.58	p<0.01	Validated
H15. Culture has a significant, positive effect on customer satisfaction.	0.15	p=0.01	Not Validated

Nine hypotheses tested true while six tested negatives with p values outside the significant range. This represents a 60% validation of the 15 hypotheses.

Table 4.16: North America - Effective sizes for path coefficients

	ServQual	Satisfaction	Image	Function	Value	Culture	Loyalty
ServQual				0.301			
Satisfaction	0.341		0.099		0.083	0.084	
Image	0.291					0.176	
Value	0.121		0.274				
Culture	0.332						
Loyalty	0.010	0.033	0.028		0.14	0.388	

4.6.4 All three continents combined

A total of 971 responses was received. The data showed good reliability with a Cronbach alpha loading of more than 0.7, which is acceptable. The model was tested for fitness and quality with APC = 0.305, p<0.001. ARS = 0.490, p<0.001 and AARS = 0.489, p<0.001 and AVIF = 2.167 which is acceptable if ≤ 5 and ideally ≤ 3.3 and AFVIF = 2.572 which is acceptable if ≤ 5 and ideally ≤ 3.3.

*p<0.05; **p<0.01; ***p<0.001

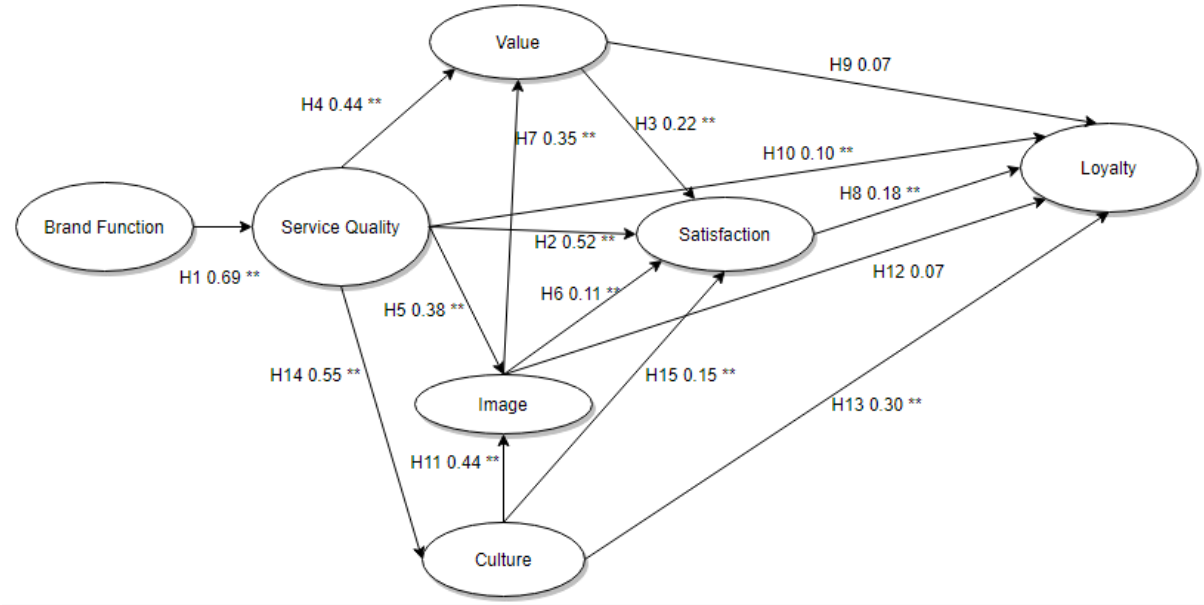

Figure 4.4: Combined SEM results

Results of hypothesis testing (Significant at $p < 0.05$ and highly significant at $p < 0.01$)

Table 4.17: Combined hypothesis testing results

Hypothesis	β Value	p-Value	Remark
H1. A brand function has a significant, positive effect on service quality.	0.69	p<0.01	Validated
H2. Service quality has a significant, positive effect on customer satisfaction.	0.52	p<0.01	Validated
H3. Perceived value has a significant, positive effect on customer satisfaction.	0.22	p<0.01	Validated
H4. Service quality has a significant, positive effect on perceived value.	0.44	p<0.01	Validated
H5. Service quality has a significant, positive effect on corporate image.	0.38	p<0.01	Validated
H6. A corporate image has a significant, positive effect on customer satisfaction.	0.11	p<0.01	Validated
H7. A corporate image has a significant, positive effect on perceived value.	0.35	p<0.01	Validated
H8. Customer satisfaction has a significant, positive effect on loyalty.	0.18	p<0.01	Validated

H9. Perceived value has a significant, positive effect on loyalty.	0.07	p=0.01	Not Validated
H10. Service quality has a significant, positive effect on loyalty.	0.10	p<0.01	Validated
H11. Culture has a significant, positive effect on corporate image.	0.44	p<0.01	Validated
H12. A corporate image has a significant, positive effect on customer loyalty.	0.07	p=0.02	Not Validated
H13. Culture has a significant, positive effect on customer loyalty.	0.30	p<0.01	Validated
H14 Service quality has a significant, positive effect on culture	0.55	p<0.01	Validated
H15. Culture has a significant, positive effect on customer satisfaction	0.15	p<0.01	Validated

13 hypotheses tested true while two tested negatives with p values outside the significant range. This represents an 86% validation of the 15 hypotheses.

Table 4.18: Combined - Effective sizes for path coefficients

	Image	Function	ServQual	Satisfaction	Value	Culture	Loyalty
Image			0.241			0.291	
ServQual		0.472					
Satisfaction	0.070		0.424		0.157	0.092	
Value	0.216		0.293				
Culture			0.303				
Loyalty	0.033		0.050	0.098	0.034	0.167	

Comparison of hypothesis validations (Y = Validated, N = Not Validated)

Table 4.19: Comparison of hypothesis results

Hypothesis	Africa	Europe	North America	Combined
H1. A brand function has a significant, positive effect on service quality.	**Y**	**Y**	**Y**	**Y**
H2. Service quality has a significant, positive effect on customer satisfaction.	**Y**	**Y**	**Y**	**Y**

H3. Perceived value has a significant, positive effect on customer satisfaction.	Y	Y	N	Y
H4. Service quality has a significant, positive effect on perceived value.	**Y**	**Y**	**Y**	**Y**
H5. Service quality has a significant, positive effect on corporate image.	**Y**	**Y**	**Y**	**Y**
H6. A corporate image has a significant, positive effect on customer satisfaction.	N	N	Y	Y
H7. A corporate image has a significant, positive effect on perceived value.	**Y**	**Y**	**Y**	**Y**
H8. Customer satisfaction has a significant, positive effect on loyalty.	Y	N	N	Y
H9. Perceived value has a significant, positive effect on loyalty.	Y	Y	N	N
H10. Service quality has a significant, positive effect on loyalty.	N	Y	N	Y
H11. Culture has a significant, positive effect on corporate image.	**Y**	**Y**	**Y**	**Y**
H12. A corporate image has a significant, positive effect on customer loyalty.	N	Y	N	N
H13. Culture has a significant, positive effect on customer loyalty.	N	Y	Y	Y
H14 Service quality has a significant, positive effect on culture	**Y**	**Y**	**Y**	**Y**
H15. Culture has a significant, positive effect on customer satisfaction	Y	Y	N	Y

Hypothesis 12 is rejected in all of the data sets except for Europe. Hypothesis 6,8,9 and 10 are also rejected in two out of four of the data sets.

4.7 The results

The use of PLS regression was employed to test the set of hypotheses. The data was reliable with Cronbach alpha greater than 0.7 in each continent per construct hypothesis and also when combined. The models were shown to be fit, with necessary coefficients being above the

minimum required, like AVIF and ARS with $p<0.001$ again per country and combined. The hypotheses were validated for each continent and also combined. Few hypotheses were rejected either on each continent or combined.

The regression analysis showed that:

i. There are indeed significant positive relationships between **brand function** and **service quality** in Africa, Europe, North America, and Combined.
ii. There is a significant positive effect of **service quality** on **customer satisfaction** in Africa, Europe, North America, and Combined.
iii. There is a significant positive effect of **perceived value** on **customer satisfaction** in Africa, Europe, Combined but not in North America.
iv. There is a significant positive effect of **service quality** on **perceived value** in Africa, Europe, North America, and Combined.
v. There is a significant positive effect of **service quality** on **corporate image** in Africa, Europe, North America, and Combined.
vi. There is a significant positive effect of **corporate image** on **customer satisfaction** in North America and Combined but not in Africa and Europe.
vii. There is a significant positive effect of **corporate image** on **perceived value** in Africa, Europe, North America, and Combined.
viii. There is a significant positive effect of **customer satisfaction** on **customer loyalty** in Africa, and Combined but not in Europe and North America.
ix. There is a significant positive effect of **perceived value** and **customer loyalty** in Africa and Europe but not in North America and Combined.
x. There is a significant positive effect of **service quality** on **customer loyalty** in Europe and Combined but not in Africa and North America.
xi. There is a significant positive effect of **culture** on a **corporate image** in Africa, Europe, North America, and Combined.
xii. There is a significant positive effect of **corporate image** on **customer loyalty** in Europe alone but not in Africa, North America, and Combined.
xiii. There is a significant positive effect of **culture** on **customer loyalty** in Europe, North America and Combined but not in Africa.
xiv. There is a significant positive effect of **service quality** on **culture** in Africa, Europe, North America, and Combined.

xv. There is a significant positive effect of **culture** on **customer satisfaction** in Africa, Europe, and Combined but not in North America.

4.8 Summary

This chapter started with the distribution of demographic data as received individually and combined. The data were tested for reliability and validity and was found to be within the acceptable Cronbach Alpha's acceptance range of 0.7 and higher. An introduction of how the hypotheses were developed, followed by the use of regression analysis by way of employing structural equation modelling to evaluate the hypotheses was carried out. The data's reliability and validity were carried out individually per continent and also combined.

Using well-known and standard techniques for analysis ensured that there is a consistency of application of techniques based on the existing body of knowledge. Choosing an appropriate methodology motivated by existing literature ensured the correctness of the process to examine hypotheses set out and the accuracy and reliability of the analysis. Each continent showed different results and also combined.

In Africa 11 out of 15 hypotheses were validated, 13 out of 15 hypotheses were validated in Europe, 9 hypotheses were validated in North America and lastly, 13 hypotheses were validated on Combined data.

CHAPTER 5
Predictive Analytics

5.1 Introduction

In this chapter, predictive modelling is introduced by employing supervised machine learning. Multiple algorithms are evaluated for accuracy and speed.

5.2 Predictive Analytics

Predictive modelling is also known as prediction analysis which encompasses a data mining process used to predict a future answer to a given problem based on a given dataset (Anifowose et al., 2016). This is achieved by statistical training models based on historical data (Dhanda, Datta, & Dhanda, 2019).

Two of the most widely used predictive modelling techniques are regression and neural networks.

5.3 Predictive Modelling Selection

The current research adopted a Supervised Machine Learning (SML) technique. The SML makes use of algorithms to be able to make predictions, these predictions can be based on quantitative data, image recognition, pattern recognition and also information extraction. This research makes use of quantitative data.

The algorithms which were evaluated are available in Rapid Miner software namely:

- Decision Tree
- Deep Learning
- Fast Large Margin
- Generalized Linear Model
- Gradient Boosted Trees
- Logistic Regression
- Naive Bayes
- Random Forest
- Decision Tree
- Support Vector Machine

5.3.1 Modelling tools

The same data used in the structural equation modelling to validate the hypotheses have been taken into machine learning after obtaining factor scores to identify a model that can make better predictions. Prediction models were tested using Rapid miner 9.7.002. (Ngwenya, 2019). The prediction is based on two columns [LTY1] and [LTY2], and each model was validated on its accuracy on the two columns individually.

- [LTY1] I am more likely to switch to another mobile telecommunications provider in the future.
- [LTY2] I am more likely to recommend the products and services of my current mobile telecommunication operator to friends and relatives.

5.3.2 How the data was trained

In each of the four continent data sets 1) Africa 2) Europe 3) North America and 4) All Combined, the data was split into two sets, the first for training and the second for testing. The training sets are made up of 80% of the data while the testing sets are made up of 20% of the data. Both the training and testing data sets were chosen randomly by Rapid Miner software. A full data set of each continent was uploaded in Rapid Miner software, the software then split the data into training and testing.

5.3.3 How the algorithm models were compared against each other

The factor scores obtained from the structural equation model were fed into the Rapid Miner. After the file was imported, a "Turbo Model" feature within Rapid Miner was used to evaluate the available algorithms. This form of the process is referred to as supervised machine learning.

5.4 Africa prediction modelling

A total of 343 responses factor scores were fed into prediction models in Rapid miner with the following characteristics:

Table 5.1: Africa [LTY1] distribution

Africa – [LTY1]	No of responses	Response Percentage
Agree	190	55.39%
Neither Agree Or Disagree	67	19.53%
Disagree	86	25.07%

Table 5.2: Africa [LTY2] distribution

Africa – [LTY2]	No of responses	Response Percentage
Agree	212	61.80%
Neither Agree Or Disagree	86	25.07%
Disagree	45	13.11%

5.4.1 Comparison of models

Table 5.3: Africa prediction model accuracy comparison

	Africa - [LTY1]		Africa - [LTY2]	
Model	Accuracy	Standard Deviation	Accuracy	Standard Deviation
Decision Tree	**87,74%**	**2,88%**	80,37%	11,11%
Deep Learning	79,32%	5,48%	77,84%	8,94%
Fast Large Margin	86,79%	5,69%	84,79%	7,83%
Generalized Linear Model	83,89%	6,40%	77,47%	8,71%
Gradient Boosted Trees	**87,74%**	**2,88%**	**85,79%**	**5,42%**
Logistic Regression	56,58%	4,21%	70,11%	5,57%
Naive Bayes	77,58%	4,27%	79,84%	3,26%
Random Forest	79,63%	3,28%	80,74%	7,15%
Decision Tree	**87,74%**	**2,88%**	**85,79%**	**6,47%**
Support Vector Machine	**87,74%**	**2,88%**	80,37%	11,11%

Based on the model accuracies for [LTY1], three models showed the same level of accuracy. On [LTY2] the Gradient Boosted Trees model is chosen based on its lower standard deviation of 5.42% compared to the Support Vector Machine model which yielded the same accuracy of 85.79% however, with a standard deviation of 6.47%. For comparison of weights, from [LTY1] the Decision tree model is chosen and compared to the Gradient Boosted Trees model of [LTY2].

5.4.2 Comparison of model weights

Table 5.4: Africa comparison of model weights

Africa - [LTY1] - Decision Tree model		Africa - [LTY2] - Gradient Boosted Trees model	
Attribute	**Weight**	**Attribute**	**Weight**
LTY2	0,876	LTY1	0,732
SQL6	0,108	SQL1	0,100
SQL1	0,091	SQL6	0,100
Mobile operator	0,077	STF3	0,084
CLT2	0,066	CLT2	0,066
CLT12	0,062	Age group	0,055
CLT10	0,047	IMG4	0,054
CLT3	0,045	CLT10	0,050
Age group	0,044	IMG2	0,043
CLT11	0,039	CLT13	0,042
IMG5	0,037	CLT12	0,039
STF1	0,037	SQL5	0,036
VAL2	0,037	Mobile operator	0,035
CLT13	0,036	CLT7	0,035
IMG2	0,034	IMG5	0,033
SQL5	0,034	IMG3	0,032
CLT6	0,033	VAL2	0,031
STF3	0,033	STF6	0,030
CLT7	0,032	CLT6	0,029
STF6	0,032	STF1	0,029
FNC1	0,031	CLT11	0,027
IMG4	0,030	VAL1	0,027
Occupation level	0,030	CLT4	0,027
IMG3	0,029	SQL2	0,024
CLT4	0,028	STF5	0,023
STF5	0,027	SQL4	0,022
VAL1	0,026	Gender	0,021
CLT1	0,025	Occupation level	0,020
STF4	0,020	IMG1	0,020
SQL3	0,020	STF2	0,019
CLT8	0,020	FNC1	0,018
IMG1	0,019	CLT3	0,017
STF2	0,017	STF4	0,016
FNC2	0,017	FNC2	0,015
Experience using mobile telecom	0,016	SQL3	0,015
FNC3	0,016	CLT5	0,012
CLT9	0,015	CLT1	0,012
		FNC3	0,009

CLT5	0,014	CLT8	0,009
SQL4	0,013	Experience using mobile telecom	0,008
Gender	0,010	CLT9	0,007
SQL2	0,005		

Testing to see if any of the seven construct variables are represented in the top seven weights:

For [LTY1] the top seven construct variables are Loyalty [LTY2], Service Quality [SQL6] [SQL1], the demographic [Mobile operator], Culture [CLT2] [CLT12] [CLT10]. For [LTY2] the top seven construct variables are Loyalty [LTY1], Service Quality [SQL1] [SQL6] [STF3], Culture [CLT2], the demographic [Age group] and Image [IMG4].

5.4.3 Model characteristics

Table 5.5: Africa – [LTY1] Decision Tree Performance

Criterion	Value	Standard Deviation
Accuracy	87.7%	+-2.9%
Classification Error	12.3%	+-2.9%
Profits from model	74	
Profits for the best Option(Agree)	12	
Gains	62	

Table 5.6: Africa – [LTY1] Confusion Matrix

	True Neither Agree Or Disagree	True Disagree	True Agree	Class Precision
Predicted Neither Agree Or Disagree	22	1	1	91.67%
Predicted Disagree	0	11	1	91.67%
Predicted Agree	2	7	53	85.48%
Class Recall	91.67%	57.89%	96.36%	

Table 5.7: Africa – [LTY2] Gradient Boosted Trees Performance

Criterion	Value	Standard Deviation
Accuracy	85.8%	+-5.4%
Classification Error	14.2%	+-5.4%

Profits from model	70	
Profits for the best Option(Agree)	24	
Gains	46	

Table 5.8: Africa – [LTY2] Confusion Matrix

	True Neither Agree Or Disagree	True Disagree	True Agree	Class Precision
Predicted Neither Agree Or Disagree	19	3	0	86.36%
Predicted Disagree	3	55	4	88.71%
Predicted Agree	1	3	10	71.43%
Class Recall	82.61%	90.16%	71.43%	

5.4.4 Summary of insights

It is observed from the comparison of the weights that the heaviest attribute in [LTY1] is [LTY2] and the heaviest attribute in [LTY2] is [LTY1] thereby meaning that both of the tested prediction models are similar. This is evident also by the next two heaviest attributes coming from Service Quality in both [LTY1] and [LTY2]. In a comparison of the top five heavy attributes, [LTY1] comprises of attributes from Loyalty, Service Quality, Culture, and the Mobile Operator demographic, whereas [LTY2] comprises attributes from Loyalty, Service Quality, Satisfaction, and Culture constructs.

It can be deduced that for [LTY1], 55% of the respondents are likely to switch mobile operators, this can mean that in Africa people are not necessarily loyal, all they are seeking is Service Quality, Culture, and are hopping around operators. This is evident from the top 5 weights which include the [Mobile Operator]

It can also be deduced that for [LTY2], 61% of the respondents are likely to recommend products or services of their current operators, in comparison to weights of [LTY1] there is a new weight in [LTY2] of Satisfaction, this could mean that consumers are seemingly willing to recommend products or services of their current mobile operator because they may be satisfied with products or services which they know.

5.5 Europe prediction modelling

A total of 421 response factor scores were fed into prediction models in Rapid miner with the following characteristics:

Table 5.9: Europe [LTY1] distribution

Europe – [LTY1]	No of responses	Response Percentage
Agree	296	70.3%
Neither Agree Or Disagree	94	22.3%
Disagree	31	7.4%

Table 5.10: Europe [LTY2] distribution

Europe – [LTY2]	No of responses	Response Percentage
Agree	320	76.6%
Neither Agree Or Disagree	82	19.5%
Disagree	19	4.5%

70% of the responses show that respondents are likely to switch mobile operators whereas 76% of the respondents are likely to recommend products or services of their current mobile operators to other persons related to them.

5.5.1 Comparison of model weights

Table 5.11: Europe prediction model accuracy comparison

	Europe - [LTY1]		Europe - [LTY2]	
Model	Accuracy	Standard Deviation	Accuracy	Standard Deviation
Decision Tree	**85,83%**	**6,97%**	87,60%	5,11%
Deep Learning	81,67%	2,28%	81,00%	2,16%
Fast Large Margin	85,00%	6,32%	83,47%	0,30%
Generalized Linear Model	81,67%	2,28%	**88,40%**	**3,57%**
Gradient Boosted Trees	**85,83%**	**6,97%**	85,97%	2,11%
Logistic Regression	79,17%	8,84%	76,10%	5,70%
Naive Bayes	82,50%	5,43%	83,47%	2,96%
Random Forest	75,83%	5,43%	86,80%	6,77%
Support Vector Machine	85,00%	4,75%	85,93%	3,79%

The Decision Tree model was chosen over the Gradient Boosted Trees model because it was faster to execute. The execution took 7 seconds to execute compared to 54 seconds for the Gradient Boosted Trees model, and it took 311 milliseconds to train the Decision Tree model versus 373 milliseconds for the Gradient Boosted Trees model.

5.5.2 Comparison of model weights

Table 5.12: Europe model weights comparison

Europe - [LTY1] – Decision Tree Model		Europe - [LTY2] – Generalised Linear Model	
Attribute	**Weight**	**Attribute**	**Weight**
LTY2	0,85	LTY1	0,36
STF4	0,11	CLT4	0,33
VAL1	0,09	CLT1	0,11
IMG4	0,07	SQL5	0,11
CLT13	0,07	CLT6	0,11
IMG3	0,07	CLT3	0,11
SQL4	0,06	SQL2	0,10
STF3	0,05	STF1	0,10
CLT7	0,05	IMG4	0,09
CLT9	0,05	VAL1	0,09
STF5	0,05	Occupation level	0,07
SQL2	0,05	IMG5	0,07
FNC1	0,05	CLT13	0,06
STF6	0,04	CLT5	0,06
Age group	0,04	CLT10	0,06
STF1	0,04	SQL3	0,06
Experience using mobile telecom	0,04	CLT11	0,05
CLT5	0,04	FNC2	0,05
CLT3	0,03	SQL1	0,04
FNC3	0,03	IMG1	0,04
STF2	0,03	Experience using mobile telecom	0,04
Occupation level	0,03	Gender	0,03
FNC2	0,03	STF3	0,03
CLT10	0,02	IMG3	0,03
CLT11	0,02	SQL6	0,03
Mobile operator	0,02	CLT9	0,03
IMG2	0,02	CLT12	0,03
CLT1	0,02	CLT2	0,02
IMG5	0,02	Mobile operator	0,02
CLT6	0,02	CLT8	0,02

Gender	0,02		CLT7	0,02	
CLT4	0,01		VAL2	0,02	
CLT12	0,01		STF5	0,01	
CLT8	0,01		SQL4	0,01	
SQL6	0,01		STF6	0,01	
SQL5	0,01		FNC3	0,01	
SQL3	0,01		STF4	0,01	
CLT2	0,01		STF2	0,01	
VAL2	0,01		Age group	0,00	
IMG1	0,00		FNC1	0,00	
SQL1	0,00		IMG2	0,00	

Testing to see if any of the seven construct variables are represented in the top seven weights:

For [LTY1] the top 7 most important weights are from Loyalty [LTY2], Satisfaction [STF4], Value [Val1], Image [IMG4], Culture [CLT13], Image [IMG4] and Service Quality [SQL4] constructs, these are different from the top 7 weights of [LTY2] which are Loyalty [LTY1], Culture [CLT4] [CLT1] [CLT6] [CTL3] and Service Quality [SQL5] [SQL2]. For [LTY2] the Culture construct weighs more heavily than [LTY1] where all seven constructs are represented in the top seven.

5.5.3 Model characteristics

Table 5.13: Europe – [LTY1] Decision Tree Model Performance

Criterion	Value	Standard Deviation
Accuracy	85.8%	+-7.0%
Classification Error	14.2%	+-7.0%
Profits from model	86	
Profits for the best Option(Agree)	50	
Gains	36	

Table 5.14: Europe – [LTY1] Decision Tree Confusion Matrix

	True Neither Agree Or Disagree	True Disagree	True Agree	Class Precision
Predicted Neither Agree Or Disagree	80	3	6	89.89%
Predicted Disagree	3	22	2	81.48%

Predicted Agree	2	1	1	25.00%
Class Recall	94.12%	84.62%	11.11%	

Table 5.15: Europe – [LTY2] Generalised Linear Model Performance

Criterion	Value	Standard Deviation
Accuracy	88.4%	+-3.6%
Classification Error	11.6%	+-3.6%
Profits from model	93	
Profits for the best Option(Agree)	59	
Gains	34	

Table 5.16: Europe – [LTY2] Generalised Linear Model Confusion Matrix

	True Neither Agree Or Disagree	True Disagree	True Agree	Class Precision
Predicted Neither Agree Or Disagree	86	4	5	90.53%
Predicted Disagree	4	19	1	79.17%
Predicted Agree	0	0	2	100%
Class Recall	95.56%	82.61%	25.00%	

5.5.4 Summary of insights

The best prediction models for the two tested scenarios are different, for [LTY1] the Decision Tree model was the best coming in at 85.3% accuracy with better processing time in comparison to the Gradient Boosted Trees model which also came in at 85.3% accuracy but took a long time to execute and train. The Decision Tree model provides a diverse representation from the top 5 weights from the construct variables with variables from five constructs, versus only three constructs showing in the Gradient Boosted Trees model.

The analysis showed that 70% of the participants are likely to switch mobile operators and that 76% are very likely to recommend product and services to others. Thus, it can be concluded that loyalty in Europe is based on the ability of consumers to recommend a mobile operator's product and/or services to friends and relatives. One may question the alignment of these two aspects; not only being more likely to recommend products but at the same time being more likely to switch mobile operators. From a different perspective, it could be that the participants

want to use the same mobile operator as their friends and relatives since there is only a difference of 6% between 'more likely to switch mobile operators' and 'to recommend products to friends and families'.

5.6 North America prediction modelling

A total of 207 response factor scores were fed into prediction models in Rapid miner with the following characteristics:

Table 5.17: North America [LTY1] distribution

NA – [LTY1]	No of responses	Response Percentage
Agree	113	54.6%
Neither Agree Or Disagree	67	32.4%
Disagree	27	13%

Table 5.18: North America [LTY2] distribution

NA – [LTY2]	No of responses	Response Percentage
Agree	123	59.4%
Neither Agree Or Disagree	69	33.3%
Disagree	15	7.2%

56% of the participants are more likely to switch to another mobile operator, whereas 59% are more likely to recommend the product and services of their current mobile operator. The failure to remain on the same network can be attributed to the SEM hypothesis, which was not validated "H8. Customer satisfaction has a significant, positive effect on loyalty."

5.6.1 Comparison of models

Table 5.19: North America Model Performance comparison

	NA - [LTY1]		NA - [LTY2]	
Model	Accuracy	Standard Deviation	Accuracy	Standard Deviation
Decision Tree	81,21%	4,74%	77,88%	9,75%
Deep Learning	76,36%	8,87%	77,73%	12,02%
Fast Large Margin	79,55%	5,25%	77,73%	13,39%

Generalized Linear Model	77,88%	5,07%	79,55%	7,89%
Gradient Boosted Trees	79,55%	5,25%	79,55%	7,89%
Logistic Regression	53,33%	13,94%	66,67%	8,33%
Naive Bayes	76,52%	10,61%	72,88%	9,08%
Random Forest	**81,67%**	**3,73%**	**84,55%**	**9,78%**
Support Vector Machine	76,21%	4,10%	79,39%	12,13%

On both [LTY1] and [LTY2] the Random Forest model was the best prediction model with 81.67% and 84,55% respectively.

5.6.2 Comparison of model weights

Table 5.20: North America model weights comparison

NA - [LTY1] – Random Forest Model		NA - [LTY2] – Random Forest Model	
Attribute	Weight	Attribute	Weight
LTY2	0,71	LTY1	0,70
STF4	0,17	CLT13	0,17
CLT13	0,16	STF4	0,13
CLT12	0,14	SQL4	0,11
SQL4	0,09	SQL6	0,11
SQL6	0,08	CLT12	0,08
STF1	0,08	CLT2	0,07
VAL2	0,07	STF2	0,07
CLT2	0,07	Occupation level	0,07
IMG2	0,07	CLT11	0,06
Occupation level	0,06	STF3	0,06
CLT7	0,05	CLT9	0,06
CLT6	0,05	VAL2	0,05
STF2	0,05	CLT10	0,05
CLT11	0,04	FNC3	0,04
CLT9	0,04	CLT7	0,04
CLT8	0,04	Age group	0,04
STF6	0,04	Gender	0,04
Experience using mobile telecom	0,04	VAL1	0,04
FNC2	0,03	CLT6	0,03
IMG5	0,03	Experience using mobile telecom	0,03
CLT5	0,03	IMG1	0,03
CLT10	0,03	IMG5	0,03
STF3	0,03	STF6	0,03

Age group	0,03		CLT5	0,03	
CLT1	0,02		CLT1	0,03	
VAL1	0,02		SQL3	0,03	
CLT3	0,02		FNC2	0,02	
SQL3	0,02		CLT3	0,02	
IMG1	0,02		SQL5	0,02	
Gender	0,02		Mobile operator	0,02	
IMG3	0,02		SQL2	0,02	
STF5	0,02		SQL1	0,02	
IMG4	0,02		IMG3	0,02	
Mobile operator	0,02		FNC1	0,01	
FNC1	0,02		STF5	0,01	
SQL2	0,02		STF1	0,01	
CLT4	0,02		IMG2	0,01	
SQL1	0,01		IMG4	0,01	
SQL5	0,01		CLT4	0,01	
FNC3	0,00		CLT8	0,01	

Testing to see if any of the seven construct variables are represented in the top seven weights:

On [LTY1] the main weight is [LTY2] and on [LTY2] the main weight is [LTY1] with almost equal weighting at 0.71 and 0.70 respectively. On [LTY1] the top seven weights on variable constructs are Loyalty [LTY2], Satisfaction [STF4] [STF1], Culture [CLT13] [CLT12] and Service Quality [SQL4] [SQL6], in total four constructs are represented. For [LTY2], the top seven variable constructs are Loyalty [LTY1], Culture [CLT13] [CLT12] [CLT2], Satisfaction [STF4] and Service Quality [SQL4] [SQL6], in total four constructs are represented. The models share the same three variables in the top five namely [STF4], [CLT13] and [SQL4].

On [LTY1], Satisfaction, Culture, and Service Quality weigh equally, whereas on [LTY2] culture weighs the most after [LTY1].

5.6.3 Model characteristics

Table 5.21: NA – [LTY1] Random Forest Model Performance

Criterion	Value	Standard Deviation
Accuracy	81.7%	+-3.7%
Classification Error	18.3%	+-3.7%
Profits from model	38	
Profits for the best Option(Agree)	4	

Gains	34	

Table 5.22: Europe – [LTY2] Random Forest Model Performance

Criterion	Value	Standard Deviation
Accuracy	84.5%	+-9.8%
Classification Error	15.5%	+-9.8%
Profits from model	41	
Profits for the best Option(Agree)	13	
Gains	28	

Table 5.23: Europe – [LTY1] Random Forest Confusion Matrix

	True Neither Agree Or Disagree	True Disagree	True Agree	Class Precision
Predicted Neither Agree Or Disagree	29	3	2	85.29%
Predicted Disagree	3	18	3	75.00%
Predicted Agree	0	0	2	100.00%
Class Recall	90.62%	85.71%	28.57%	

Table 5.24: Europe – [LTY2] Random Forest Confusion Matrix

	True Neither Agree Or Disagree	True Disagree	True Agree	Class Precision
Predicted Neither Agree Or Disagree	32	1	2	91.43%
Predicted Disagree	0	1	2	33.33%
Predicted Agree	4	0	17	80.95%
Class Recall	88.89%	50.00%	80.95%	

5.6.4 Summary of insights

The two best models are almost similar in performance and weights, with [STF4], [CLT13], and [SQL4] all being present in their top five weights. It is noted that from the SEM culture hypothesis "H13. Culture has a significant, positive effect on customer loyalty." and service quality hypothesis "H10. Service quality has a significant, positive effect on loyalty." both have been validated to have a significant positive effect on loyalty.

It is interesting that in the two models a variable from the customer satisfaction construct is among the top five, while in the SEM customer satisfaction "H8. Customer satisfaction has a significant, positive effect on loyalty." was not shown to have a significant positive effect on loyalty.

5.7 Combined prediction modelling

A total of 971 responses factor scores were fed into prediction models in Rapid miner with the following characteristics:

Table 5.25: Combined [LTY1] distribution

All Combined – [LTY1]	No of responses	Response Percentage
Agree	599	61.7%
Neither Agree Or Disagree	247	25.4%
Disagree	125	12.9%

Table 5.26: Combined [LTY2] distribution

All Combined – [LTY2]	No of responses	Response Percentage
Agree	655	67.5%
Neither Agree Or Disagree	237	24.4%
Disagree	79	8.1%

61% of participants are more likely to switch operators while 67% are willing to recommend the products and services of their current mobile operator to friends and relatives.

5.7.1 Comparison by continent

Table 5.27: Continent [LTY1] distribution vs combined

[LTY1]	Africa	Europe	NA	Combined
Agree	55.39%	70.3%	54.6%	61.7%
Neither Agree Or Disagree	19.53%	22.3%	32.4%	25.4%
Disagree	25.07%	7.4%	13%	12.9%

Table 5.28: Continent [LTY2] distribution vs combined

[LTY1]	Africa	Europe	NA	Combined
Agree	61.80%	76.6%	59.4%	67.5%

Neither Agree Or Disagree	25.07%	19.5%	33.3%	24.4%
Disagree	13.11%	4.5%	7.2%	8.1%

Europe is leading in both more likely to switch mobile operators and more likely to recommend products and services of their mobile operators, followed by Africa than North America.

5.7.2 Comparison of models

Table 5.29: Combined accuracy model comparison

	All Combined - [LTY1]		All Combined - [LTY2]	
Model	Accuracy	Standard Deviation	Accuracy	Standard Deviation
Decision Tree	85,25%	2,99%	83,05%	3,15%
Deep Learning	76,49%	6,67%	84,83%	2,11%
Fast Large Margin	**85,60%**	**3,40%**	86,69%	1,02%
Generalized Linear Model	81,65%	1,57%	83,46%	1,88%
Gradient Boosted Trees	85,24%	3,27%	84,90%	2,68%
Logistic Regression	76,60%	5,03%	75,91%	3,67%
Naive Bayes	72,93%	3,09%	80,88%	2,24%
Random Forest	83,81%	1,81%	86,68%	2,76%
Support Vector Machine	85,25%	2,99%	**88,13%**	**2,42%**

Based on the model accuracies, for [LTY1], the Fast Large Margin model scored better with 85.6% with a standard deviation of 3.4%. For [LTY2] Support Vector Machine model scored better than all models with 88.13% and a standard deviation of 2.42%. It is observed that the Decision Tree model is best for Africa and North America for [LTY1] while the Random Forest model is best for North America for both [LTY1] and [LTY2].

5.7.3 Comparison of model weights

Table 5.30: Combined model weights comparison

Combined - [LTY1] – Fast Large Margin		Combined - [LTY2] – Support Vector Machine	
Attribute	Weight	Attribute	Weight
LTY2	0,85	LTY1 for Agree	0,50
STF4	0,10	LTY1 for Neither Agree Or Disagree	0,21
SQL2	0,09	STF5 for Agree	0,18
SQL3	0,07	FNC1 for Agree	0,14
CLT7	0,05	IMG4 for Agree	0,13

FNC3	0,05
IMG1	0,05
CLT9	0,05
Occupation level	0,05
CLT1	0,05
Age group	0,05
Experience using mobile telecom	0,05
IMG4	0,05
IMG3	0,04
CLT11	0,04
STF6	0,04
IMG5	0,04
VAL1	0,03
CLT2	0,03
CLT6	0,03
IMG2	0,03
STF3	0,03
CLT13	0,03
Continent	0,03
FNC1	0,03
CLT12	0,03
Gender	0,03
CLT4	0,02
CLT5	0,02
SQL1	0,02
CLT3	0,02
SQL5	0,02
STF2	0,01
CLT10	0,01
STF1	0,01
STF5	0,01
CLT8	0,01
SQL4	0,01
VAL2	0,01
FNC2	0,01
SQL6	0,01

VAL1 for Agree	0,12
VAL2 for Agree	0,11
IMG2 for Neither Agree Or Disagree	0,11
CLT13 for Agree	0,10
CLT8 for Agree	0,10
CLT1 for Agree	0,10
CLT4 for Agree	0,10
SQL6 for Neither Agree Or Disagree	0,09
STF6 for Neither Agree Or Disagree	0,09
STF1 for Agree	0,09
Continent for Disagree	0,08
Mobile operator for Disagree	0,08
CLT7 for Agree	0,08
CLT5 for Neither Agree Or Disagree	0,08
CLT6 for Agree	0,08
STF6 for Agree	0,08
CLT1 for Neither Agree Or Disagree	0,08
Gender for Agree	0,08
Occupation level for Neither Agree Or Disagree	0,07
CLT10 for Neither Agree Or Disagree	0,07
IMG4 for Disagree	0,07
CLT2 for Agree	0,06
SQL2 for Neither Agree Or Disagree	0,06
IMG2 for Disagree	0,06
STF5 for Neither Agree Or Disagree	0,06
CLT12 for Neither Agree Or Disagree	0,06
Experience using mobile telecom for Neither Agree Or Disagree	0,06
SQL3 for Agree	0,05
FNC2 for Agree	0,05
Experience using mobile telecom for Agree	0,05
FNC3 for Neither Agree Or Disagree	0,05
CLT6 for Neither Agree Or Disagree	0,05
CLT1 for Disagree	0,04
SQL1 for Disagree	0,04
STF2 for Agree	0,04
CLT9 for Agree	0,04
SQL5 for Disagree	0,04
IMG3 for Agree	0,04
SQL1 for Neither Agree Or Disagree	0,04
Continent for Agree	0,04

	IMG4 for Neither Agree Or Disagree	0,04
	CLT11 for Neither Agree Or Disagree	0,04
	CLT13 for Disagree	0,04
	CLT2 for Neither Agree Or Disagree	0,04
	CLT8 for Neither Agree Or Disagree	0,04
	FNC2 for Neither Agree Or Disagree	0,04
	CLT11 for Agree	0,04
	LTY1 for Disagree	0,04
	SQL2 for Disagree	0,04
	STF3 for Neither Agree Or Disagree	0,03
	SQL4 for Agree	0,03
	SQL6 for Disagree	0,03
	Occupation level for Agree	0,03
	Age group for Disagree	0,03
	SQL2 for Agree	0,03
	STF2 for Neither Agree Or Disagree	0,03
	SQL1 for Agree	0,03
	IMG2 for Agree	0,03
	FNC2 for Disagree	0,03
	CLT10 for Disagree	0,03
	SQL5 for Neither Agree Or Disagree	0,03
	CLT5 for Agree	0,03
	CLT13 for Neither Agree Or Disagree	0,03
	CLT5 for Disagree	0,03
	CLT2 for Disagree	0,03
	CLT10 for Agree	0,03
	VAL1 for Disagree	0,02
	VAL1 for Neither Agree Or Disagree	0,02
	CLT3 for Agree	0,02
	STF2 for Disagree	0,02
	CLT6 for Disagree	0,02
	Continent for Neither Agree Or Disagree	0,02
	SQL4 for Neither Agree Or Disagree	0,02
	Occupation level for Disagree	0,02
	STF4 for Agree	0,02
	CLT7 for Disagree	0,02
	STF1 for Neither Agree Or Disagree	0,02
	SQL3 for Disagree	0,02
	CLT4 for Neither Agree Or Disagree	0,02
	CLT8 for Disagree	0,02
	Mobile operator for Agree	0,02

	CLT9 for Neither Agree Or Disagree	0,02
	FNC1 for Disagree	0,02
	IMG5 for Neither Agree Or Disagree	0,02
	Gender for Disagree	0,02
	CLT9 for Disagree	0,02
	IMG3 for Neither Agree Or Disagree	0,02
	STF6 for Disagree	0,02
	STF4 for Neither Agree Or Disagree	0,02
	CLT3 for Disagree	0,02
	CLT7 for Neither Agree Or Disagree	0,02
	Experience using mobile telecom for Disagree	0,02
	CLT11 for Disagree	0,02
	FNC1 for Neither Agree Or Disagree	0,02
	IMG1 for Agree	0,01
	STF1 for Disagree	0,01
	CLT4 for Disagree	0,01
	IMG1 for Neither Agree Or Disagree	0,01
	IMG5 for Disagree	0,01
	FNC3 for Disagree	0,01
	IMG3 for Disagree	0,01
	VAL2 for Disagree	0,01
	SQL4 for Disagree	0,01
	CLT12 for Disagree	0,01
	STF3 for Disagree	0,01
	SQL3 for Neither Agree Or Disagree	0,01
	IMG5 for Agree	0,01
	STF5 for Disagree	0,01
	CLT3 for Neither Agree Or Disagree	0,01
	Gender for Neither Agree Or Disagree	0,01
	Age group for Agree	0,01
	IMG1 for Disagree	0,01
	STF4 for Disagree	0,01
	STF3 for Agree	0,01
	SQL6 for Agree	0,01
	Mobile operator for Neither Agree Or Disagree	0,01
	SQL5 for Agree	0,01
	CLT12 for Agree	0,00
	FNC3 for Agree	0,00
	VAL2 for Neither Agree Or Disagree	0,00
	Age group for Neither Agree Or Disagree	0,00

It becomes difficult to compare the model weights as the two best models do not weigh the variables in the same way. The Support Vector model goes deeper into the impact of each selected variable.

5.7.4 Model characteristics

Table 5.31: Combined – [LTY1] Fast Large Margin Model Performance

Criterion	Value	Standard Deviation
Accuracy	85.6%	+-3.4%
Classification Error	14.4%	+-3.4%
Profits from model	198	
Profits for the best Option(Agree)	74	
Gains	124	

Table 5.32: Combined – [LTY2] Support Vector Machine Model Performance

Criterion	Value	Standard Deviation
Accuracy	88.1%	+-2.4%
Classification Error	11.9%	+-2.4%
Profits from model	212	
Profits for the best Option(Agree)	102	
Gains	110	

Table 5.33: Combined – [LTY1] Fast Large Margin Model Confusion Matrix

	True Neither Agree Or Disagree	True Disagree	True Agree	Class Precision
Predicted Neither Agree Or Disagree	54	5	4	85.71%
Predicted Disagree	3	15	3	71.43%
Predicted Agree	11	14	169	87.11%
Class Recall	79.41%	44.12%	96.02%	

Table 5.34: Combined – [LTY2] Support Vector Machine Confusion Matrix

	True Neither Agree Or Disagree	True Disagree	True Agree	Class Precision
Predicted Neither Agree Or Disagree	59	11	2	81.94%
Predicted Disagree	10	178	8	90.82%
Predicted Agree	1	1	8	80.00%
Class Recall	84.29%	93.68%	44.44%	

5.7.5 Summary of insights

The best model for the combined data for [LTY1] is Fast Large Margin with a classification error of 14.4%, while the [LTY2]'s best model is Support Vector Machine with a classification error of 11.9%. The SVM model yielded a lower classification error percentage. In the pursuit of a prediction model, the classification error plays a significant role as it determines the extent to which the model can be wrong, so any model that is high inaccuracy is the winner.

The most accurate model overall for [LTY2] is the Generalized Linear Model with 88.40% accuracy, and for [LTY1] it is Decision Tree with 87.74% accuracy.

5.8 Best model comparisons

Table 5.35: Best accuracy model comparisons

	Africa	Europe	NA	All Combined
[LTY1]	Decision Tree – 87.74%	Decision Tree - 85.83%	Random Forest - 81.67%	Fast Large Margin – 85.60%
[LTY2]	Gradient Boosted Trees – 85.79%	Generalized Linear Model - 88.40%	Random Forest - 84.55%	Support Vector Machine – 88.13%

The Random Forest model is consistent in North America; however, the model is the worst compared to other models which were the best models in [LTY1] and [LTY2]. The Decision Tree model was recorded on two continents for [LTY1] and [LTY2] as the best model. The model with the best accuracy out of all of them is the Generalized Linear model with 88.40%,

however, this model was outperformed in other tests for other continents and only featured once as the best model on other criteria.

5.9 Summary

Algorithms are developed to learn using a given data set so that a prediction can be made. Predictions are used to anticipate the future through controlled modelling from data patterns. No one algorithm is best for all kinds of data; therefore, the testing of a few algorithms is essential until one reaches the desired level of accuracy and performance.

Accuracy of prediction was used to determine the best prediction model, where models performed equally, the time cost was used to select the model with a lower cost. It was observed that no one model was best for both prediction columns. The Decision Tree and Random Forest models were better models as they appeared twice to be the best models. Random Forest, even though it was the best model twice for North America, it was the lowest-scoring model when compared to the best scoring models chosen for other continents for both [LTY1] and [LTY2].

None of the models tested reached 90% accuracy, although the Generalized Linear Model nearly reached it by scoring 88.4%.

CHAPTER 6
Conclusions and contributions

6.1 Introduction

This study began with the objective to examine how brand function and corporate image create loyalty in North America, Europe and Africa. The research started with the aim of examining the impact of brand function and corporate image on loyalty in telecommunication service providers in Africa, Europe, and North America. The objective was to examine if there are significant positive effect between (1) Brand function and Service Quality (2) Service Quality and Value, Corporate Image, Satisfaction, Culture, Loyalty (3) Culture and Satisfaction, Loyalty, Corporate Image (4) Corporate Image and Value, Loyalty and Satisfaction (5) Value, Satisfaction and Loyalty. A conceptual model was drawn, and hypotheses were developed.

A total of 971 responses were revived via an anonymous online survey. PLS regression was used to test the construct validity for each continent and also for the data combined.

After the hypotheses were evaluated and validated in their majority, the same data was used for regression analysis to try and evaluate the best possible prediction model from a range of machine learning algorithms. The predictions were based on the two loyalty questions which were set out in the survey. The hypotheses need to be validated first before the introduction of predictive modelling because if the majority of the hypotheses were not validated, then the predictions would be based on an invalidated concept.

6.2 Research Results

The regression analysis proved that (1) brand function has a significant, positive effect on service quality (2) service quality has a significant, positive effect on customer satisfaction (3) service quality has a significant, positive effect on perceived value (4) service quality has a significant, positive effect on corporate image (5) corporate image has a significant, positive effect on perceived value (6) culture has a significant, positive effect on corporate image and (7) service quality has a significant, positive effect on culture in all three continents and combined. This substantiates the importance of service quality, brand function and corporate image as key driving factors.

Interestingly, the corporate image has no significant, positive effect on customer loyalty in Africa, North America and Combined, it is only significant in Europe. Therefore, corporate image has a significant positive effect on other tested constructs but not customer loyalty except in Europe where it is significant.

6.3 Key contributions

The research provided references to existing literature that showed relationship impacts of brand function, customer satisfaction, perceived value, corporate image, culture, and service quality on loyalty. Brand function, customer satisfaction, perceived value, corporate image, and service quality are constructs within brand engineering; marketers use them to set their brands apart from their competitors. By working on them individually, brand managers want their brands to stay in the minds of customers and thereby achieve loyalty in the form of retaining the same customers, and also of the same customers recommending others to consume the product and/or services of the brand.

Other studies have not taken into account the purpose of the brand function. This study examined the effect of brand function on service quality since brand function speaks to those brands that pride themselves on service quality to obtain loyalty or preference among customers who are looking for a quality product or service. Other studies acknowledge culture as affecting loyalty. However, these other studies did not examine the effect of culture on corporate image or the effect of culture on value. In this study, the effect of culture has been examined concerning customer satisfaction, value, and image, as well as loyalty.

6.4 Limitations and Recommendations

6.4.1 Limitations

The study was conducted via an anonymous survey and limited to online responses. Online anonymous surveys have the challenge of not being able to make sure that no one person takes the survey more than once. One cannot be sure that if the same survey were to be sent out to the same people, who were unknown, that the same results would be obtained. No formal interviews were done during this survey. Due to virtual private networks, one isn't 100% certain that the surveys were actually done by persons living in the continents because virtual private networks can mask a person's location to another continent. As it is, the platform Survey Monkey targeted users in different continents based on its own criteria therefore, the data is trusted to be coming from the three continents.

6.4.2 Recommendations

Telecommunications managers must be aware that their brand is a tool that is used to communicate with customers therefore, when a customer sees their brand it needs to resonate with them, customers must get a service that meets their expectations, if not more. Managers need to take into account that loyalty isn't defined by one concept of service delivery or culture, it is a complex item that must be continuously worked on. Therefore, the recommendation to telecommunications managers is to create a system that can monitor the favourability of their brand by its customers and prospectus customers, maintaining a quality service which customers can be proud of. This system must include as many dimensions/constructs of branding like brand image, service quality, value, brand attachment, brand awareness, brand judgement and customer satisfaction. Managers must always look at branding holistically and overtime adjust branding dimensions which their organisation may be lagging in order to keeps its customers happy and attracting new ones.

For future work, a mixture of online surveys and interviews can be conducted. More focus can be put on brand awareness, brand attachment, service performance and brand equity as they are variables within brand engineering.

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Appendices

Appendix A: Ethical Clearance

UNISA university of south africa

UNISA COLLEGE OF SCIENCE, ENGINEERING AND TECHNOLOGY'S (CSET) RESEARCH AND ETHICS COMMITTEE

25 February 2019

RECEIVED
2020 -02- 26
OFFICE OF THE EXECUTIVE DEAN
College of Science, Engineering and Technology

Ref #: 044/DCM/2019/CSET_SOC
Name: Mr Doko Clene Mohlala
Student #: 41190106

Dear Mr Doko Clene Mohlala

Decision: Ethics Approval for 3 years
(Humans involved)

Researchers: Mr Doko Clene Mohlala, Unit 33 Royal Oaks, 290 Oak Ave, Ferndale, Randburg, 2194, 41190106@mylife.unisa.ac.za, +27 73 442 7609

Project Leader(s): Prof Felix O Bankole, bankofo@unisa.ac.za, +27 11 670 9476

Working Title of Research:

How brand function, quality, value, corporate image, culture, and satisfaction create loyalty in North America, Europe and Africa's telecom providers

Qualification: MSc in Computing

Thank you for the application for research ethics clearance by the Unisa College of Science, Engineering and Technology's (CSET) Research and Ethics Committee for the above-mentioned research. Ethics approval is granted for a period of three years, from 25 February 2020 to 25 February 2023.

1. The researcher will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the Unisa College of Science, Engineering and Technology's (CSET) Research and Ethics Committee. An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.

The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.

3. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
4. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
5. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
6. No field work activities may continue after the expiry date (25 February 2023). Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.
7. Field work activities may only commence from the date on this ethics certificate.

Note:

The reference number 044/DCM/2019/CSET_SOC *should be clearly indicated on all forms of communication with the intended research participants, as well as with the Unisa College of Science, Engineering and Technology's (CSET) Research and Ethics Committee.*

Yours sincerely

Dr. B Chimbo

Chair: Ethics Sub-Committee SoC, College of Science, Engineering and Technology (CSET)

Prof E. Mnkandla

Director: School of Computing, CSET

Prof B. Mamba

Executive Dean: CSET

Appendix B: Cover Letter for Participation in Survey

Dear Prospective participant,

You are invited to participate in a survey conducted by Doko Clene Mohlala under the supervision of Prof Felix Bankole, a professor in the Department of Computing towards a Master of Science at the University of South Africa.

The survey you have received has been designed to study the relationship between brand function, quality, value, corporate image, culture, and satisfaction creates loyalty. You were selected to participate in this survey because you are a consumer of mobile telecommunication services. You will not be eligible to complete the survey if you are younger than 18 years and do not use mobile telecommunication services and do not reside in Africa, Europe, and North America. By completing this survey, you agree that the information you provide may be used for research purposes, including dissemination through peer-reviewed publications and conference proceedings. It is anticipated that the information we gain from this survey will help us to prove the following:
H1. A brand function has a significant, positive effect on service quality.

H2. Service quality has a significant, positive effect on customer satisfaction.

H3. Perceived value has a significant, positive effect on customer satisfaction.

H4. Service quality has a significant, positive effect on perceived value.

H5. Service quality has a significant, positive effect on corporate image.

H6. A corporate image has a significant, positive effect on customer satisfaction.

H7. A corporate image has a significant, positive effect on perceived value.

H8. Customer satisfaction has a significant, positive effect on loyalty.

H9. Perceived value has a significant, positive effect on loyalty.

H10. Service quality has a significant, positive effect on loyalty.

H11. Culture has a significant, positive effect on corporate image.

H12. A corporate image has a significant, positive effect on customer loyalty.

H13. Culture has a significant, positive effect on customer loyalty.

H14 Service quality has a significant, positive effect on culture.

H15 Culture has a significant, positive effect on satisfaction.

You are, however, under no obligation to complete the survey, and you can withdraw from the study before

submitting the survey. The survey is developed to be anonymous, meaning that we will have no way of connecting the information that you provide to you personally (please note that this is only relevant to anonymous surveys). Consequently, you will not be able to withdraw from the study once you have clicked the send button based on the anonymous nature of the survey. If you choose to participate in this survey, it will take up no more than 7 minutes of your time. You will not benefit from your participation as an individual. However, it is envisioned that the findings of this study will scientifically prove the relationships that exist between brand function, quality, perceived values, service quality, culture, corporate image, satisfaction, and loyalty. We do not foresee that you will experience any negative consequences by completing the survey. The researcher(s) undertake to keep any information provided herein confidential, not to let it out of our possession, and to report on the findings from the perspective of the participating group and not from the perspective of an individual. The records will be kept for five years for audit purposes whereafter they will be permanently destroyed, hard copies will be shredded, and electronic versions will be permanently deleted from the hard drive of the computer You will not be reimbursed or receive any incentives for your participation in the survey. The research was reviewed and approved by the Prof E Mnkandla reference no **044/DCM/2019/CSET_SOC**. The primary researcher, DC Mohlala, can be contacted during office hours at +2773 442 7609. The study leader, Prof F Bankole, can be contacted during office hours at +2711 670 9476. Should you have any questions regarding the ethical aspects of the study, you can contact Prof EL Kempen, kempeel@unisa.ac.za.

Appendix C: Survey Questions

A: Demographics

[DMG1] Please select your continent.

- ◯ Africa
- ◯ Europe
- ◯ North America

[DMG2] Please select your mobile operator.

- ◯ Verizon Wireless
- ◯ AT & T mobility
- ◯ T-mobile US
- ◯ Sprint Corporation
- ◯ Vodafone (UK)
- ◯ Orange (France)
- ◯ BT (UK)
- ◯ Telecom Italia (Italy)
- ◯ MTN
- ◯ Vodacom
- ◯ Telkom
- ◯ Orascom Telecom
- ◯ Maroc Telecom
- ◯ Safaricom
- ◯ Orange
- ◯ Other(Not listed)
- ◯ Rostelecom
- ◯ MegaFon

[DMG3] Please choose your age group.

- ◯ 18 – 25
- ◯ 26 – 33
- ◯ 34 – 41
- ◯ 42 – 49
- ◯ 50 +

[DMG4] Please select your gender.

- ◯ Male
- ◯ Female
- ◯ Other

[DMG5] What is your occupation level?

◯ Employed ◯ Unemployed ◯ Other

[DMG6] Please select years of experience using mobile telecommunications services.

◯ Less than 1 year ◯ Between 2 and 5 years ◯ More than 10 years

◯ Between 1 and 2 years ◯ Between 5 and 10 years

B: Loyalty Testing - Single-Selection questions

1 = Agree; 0.5 = Neither Agree Nor Disagree; 0= Disagree

Image					
	1	[IMG1] I find mobile services (voice, data, and coverage, etc.) of my telecommunications service provider unique from other providers.	1	0.5	0
	2	[IMG2] I can clearly remember my mobile telecommunication operator on top of my head.	1	0.5	0
	3	[IMG3] When I think of telecommunication services and products my telecommunications operator comes to mind first.	1	0.5	0
	4	[IMG4] My telecommunication operator has a better reputation than its competitor.	1	0.5	0
	5	[IMG5] My telecommunication operator has good prestige.	1	0.5	0
Satisfaction					
	1	[STF1] The mobile services (voice, data, and coverage, etc.) offered by my telecommunications provider gives me confidence and dignity.	1	0.5	0
	2	[STF2] The mobile services (voice, data, and coverage, etc.) of my telecommunication operator make me feel good.	1	0.5	0
	3	[STF3] The mobile services (voice, data, and coverage, etc.) I get from the telecommunication operator that is suitable for me.	1	0.5	0
	4	[STF4] The mobile services (voice, data, and coverage, etc.) of my telecommunications give me a sense of good experience and satisfaction.	1	0.5	0
	5	[STF5] I am satisfied with my telecommunication operator.	1	0.5	0
	6	[STF6] Overall, I am satisfied with my telecommunication operator.	1	0.5	0
Function					
	1	[FNC1] There exists a dignified relationship between me and my mobile telecommunications provider in the form of function and purpose on voice, data, and coverage, etc.	1	0.5	0
	2	[FNC2] The mobile services (voice, data, and coverage, etc.) from my telecommunications provider are practical to my needs.	1	0.5	0
	3	[FNC3] The mobile services (voice, data, and coverage, etc.) I get from my telecommunications provider is reliable.	1	0.5	0
Service Quality					
	1	[SQL1] I think that the service quality I get from my telecommunications operator for voice, data, and coverage is good.	1	0.5	0
	2	[SQL2] The response I get from my telecommunications provider (reporting problems, fault finding, resolution, etc.) is responsive.	1	0.5	0
	3	[SQL3] I am happy to pay more for the delivery of mobile services (voice, data, coverage) from my telecommunication service provider.	1	0.5	0

	4	[SQL4] I am happy with the overall service quality (security, cost, delivery, etc.) from my telecommunications operator.	1	0.5	0
	5	[SQL5] The service quality I get from my telecommunications service provider meets my expectations.	1	0.5	0
	6	[SQL6] Overall, the service I receive from my telecommunication operator for mobile services (voice, data, cost, security, and coverage, etc.) is valuable.	1	0.5	0
Value					
	1	[VAL1] The service quality I receive from my telecommunication operator is worth my time, energy, and efforts.	1	0.5	0
	2	[VAL2] I am proud to be associated with my telecommunication operator.	1	0.5	0
Culture					
	1	[CLT1] I often talk about my telecommunication operator benefits (free SMS, data, and free voice minutes) with my peers.	1	0.5	0
	2	[CLT2] Using telecommunication services is a personal decision.	1	0.5	0
	3	[CLT3] I use telecommunication services less often than I need to.	1	0.5	0
	4	[CLT4] I feel comfortable when I try to use mobile telecommunication services (voice, data, and coverage, etc.). I find it clear and simple to use.	1	0.5	0
	5	[CLT5] I am conversant/familiar/up-to-date with the use of mobile telecommunication services.	1	0.5	0
	6	[CLT6] I like to show a firm statement about my character and individuality.	1	0.5	0
	7	[CLT7] Mobile Telecommunication services are highly efficient and will improve my quality of life.	1	0.5	0
	8	[CLT8] I place great value on mobile services (voice, data, and coverage, etc.) and the functions that can be achieved by using telecommunication services.	1	0.5	0
	9	[CLT9] I like being in competition with others.	1	0.5	0
	10	[CLT10] I place great value on material success.	1	0.5	0
	11	[CLT11] I like to depend on others.	1	0.5	0
	12	[CLT12] I normally agree to the expectations or suggestions of others who are seen as important or influential (e.g. my boss/celebrity).	1	0.5	0
	13	[CLT13] There is a strong association between social influences (e.g. family, friends, boss, or employer) and my intention to use telecommunication services.	1	0.5	0
Loyalty					
	1	[LTY1] I am more likely to switch to another mobile telecommunications provider in the future.	1	0.5	0
	2	[LTY2] I am more likely to recommend the products and services of my current mobile telecommunication operator to friends and relatives.	1	0.5	0

Appendix D: Africa – General SEM Analysis Results

```
General model elements
----------------------

Missing data imputation algorithm: Arithmetic Mean Imputation
Outer model analysis algorithm: PLS Regression
Default inner model analysis algorithm: Warp3
Multiple inner model analysis algorithms used? No
Resampling method used in the analysis: Stable3
Number of data resamples used: 100
Number of cases (rows) in model data: 343
Number of latent variables in model: 7
Number of indicators used in model: 37
Number of iterations to obtain estimates: 7
Range restriction variable type: None
Range restriction variable: None
Range restriction variable min value: 0.000
Range restriction variable max value: 0.000
Only ranked data used in analysis? No
```

```
Model fit and quality indices
-----------------------------

Average path coefficient (APC)=0.322, P<0.001
Average R-squared (ARS)=0.556, P<0.001
Average adjusted R-squared (AARS)=0.553, P<0.001
Average block VIF (AVIF)=2.402, acceptable if <= 5, ideally <= 3.3
Average full collinearity VIF (AFVIF)=3.192, acceptable if <= 5, ideally <= 3.3
Tenenhaus GoF (GoF)=0.589, small >= 0.1, medium >= 0.25, large >= 0.36
Sympson's paradox ratio (SPR)=1.000, acceptable if >= 0.7, ideally = 1
R-squared contribution ratio (RSCR)=1.000, acceptable if >= 0.9, ideally = 1
Statistical suppression ratio (SSR)=1.000, acceptable if >= 0.7
Nonlinear bivariate causality direction ratio (NLBCDR)=1.000, acceptable if >= 0.7
```

Path coefficients

	Image	Functio	ServQua	Satisfa	Value	Culture	Loyalty
Image			0.417			0.407	
ServQua		0.796					
Satisfa	0.097		0.447		0.334	0.143	
Value	0.350		0.519				
Culture			0.533				
Loyalty	0.137		0.075	0.298	0.164	0.109	

P values

	Image	Functio	ServQua	Satisfa	Value	Culture	Loyalty
Image			<0.001			<0.001	
ServQua		<0.001					
Satisfa	0.034		<0.001		<0.001	0.004	
Value	<0.001		<0.001				
Culture			<0.001				
Loyalty	0.005		0.081	<0.001	<0.001	0.020	

****
* Standard errors for path coefficients *
****

	Image	Functio	ServQua	Satisfa	Value	Culture	Loyalty
Image			0.051			0.051	
ServQua		0.048					
Satisfa	0.053		0.051		0.051	0.053	
Value	0.051		0.050				
Culture			0.050				
Loyalty	0.053		0.053	0.052	0.053	0.053	

****
* Effect sizes for path coefficients *
****

	Image	Functio	ServQua	Satisfa	Value	Culture	Loyalty
Image			0.263			0.255	
ServQua		0.633					
Satisfa	0.068		0.371		0.273	0.092	
Value	0.238		0.385				
Culture			0.284				
Loyalty	0.078		0.044	0.196	0.102	0.057	

	Image	Function	ServQual	Satisfac	Value	Culture	Loyalty
R-squared	0.517		0.633	0.804	0.623	0.284	0.476
Adj. R-squared	0.515		0.632	0.802	0.621	0.282	0.468
Composite reliab.	0.840	0.846	0.910	0.911	0.885	0.856	0.905
Cronbach's alpha	0.760	0.728	0.880	0.883	0.739	0.818	0.789
Avg. var. extrac.	0.515	0.648	0.630	0.632	0.793	0.327	0.826
Full collin. VIF	2.365	3.125	4.203	5.352	3.441	1.954	1.903
Q-squared	0.516		0.631	0.803	0.623	0.284	0.477
Min	-3.268	-3.044	-2.925	-2.828	-2.457	-3.512	-2.089
Max	0.977	0.828	0.850	0.926	0.810	1.436	0.841
Median	0.156	0.235	0.290	0.288	0.003	0.091	0.841
Mode	0.977	0.828	0.850	0.926	0.810	1.436	0.841
Skewness	-1.092	-1.133	-1.168	-0.997	-1.107	-0.716	-0.809
Exc. kurtosis	0.535	0.581	0.578	0.300	0.235	0.531	-0.547
Unimodal-RS	Yes	Yes	Yes	Yes	Yes	Yes	No
Unimodal-KMV	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Normal-JB	No	No	No	No	No	No	No
Normal-RJB	No	No	No	No	No	No	No
Histogram	View	View	View	View	View	View	View

Correlations among l.vs. with sq. rts. of AVEs

	Image	Functio	ServQua	Satisfa	Value	Culture	Loyalty
Image	0.717	0.634	0.626	0.685	0.674	0.622	0.567
Functio	0.634	0.805	0.794	0.759	0.655	0.530	0.573
ServQua	0.626	0.794	0.794	0.830	0.741	0.528	0.585
Satisfa	0.685	0.759	0.830	0.795	0.816	0.641	0.655
Value	0.674	0.655	0.741	0.816	0.890	0.608	0.617
Culture	0.622	0.530	0.528	0.641	0.608	0.572	0.510
Loyalty	0.567	0.573	0.585	0.655	0.617	0.510	0.909

Appendix E: Africa - Factor Loadings (PCA)

Component Matrix[a]

	Component 1	2	3	4	5
IMG1	.502	.134	-.208	-.189	.499
STF1	.645	-.055	-.377	-.187	.148
FNC1	.675	-.050	-.221	-.203	.221
FNC2	.605	-.176	-.203	-.092	.070
SQL1	.640	-.201	-.220	-.025	-.063
SQL2	.542	-.147	-.119	.006	.093
FNC3	.580	-.008	-.301	-.040	.216
SQL3	.659	-.237	-.177	.120	-.161
SQL4	.686	-.295	-.159	.009	-.149
SQL5	.675	-.255	-.168	.075	-.128
SQL6	.627	-.213	-.029	.029	-.145
STF2	.683	-.123	-.164	.021	-.115
STF3	.670	-.218	.026	.004	-.226
CLT1	.605	.232	.000	-.004	.195
STF4	.703	-.105	-.065	.083	-.098
VAL1	.697	-.138	-.020	.057	.027
VAL2	.702	-.077	.022	.048	.034
STF5	.684	-.198	.040	.134	-.175
STF6	.666	-.231	.026	.131	-.269
IMG2	.506	-.044	.165	.375	.191
IMG3	.566	.006	.189	.289	.226
IMG4	.631	.080	.091	.077	.308
IMG5	.646	-.043	.229	.109	.209
CLT2	.448	-.123	.359	.105	.046
CLT3	.292	.392	-.238	.428	.056
CLT4	.519	.023	.414	-.125	-.115
CLT5	.529	.074	.492	-.081	.064
CLT6	.524	.150	.302	.065	.121
CLT7	.587	.046	.376	-.053	-.085
CLT8	.571	.095	.342	-.167	-.044
CLT9	.483	.524	.045	.020	-.085
CLT10	.485	.486	-.019	.043	-.158
CLT11	.321	.600	-.296	.176	-.185
CLT12	.416	.589	-.106	.023	-.148
CLT13	.470	.535	-.051	-.084	-.160
LTY1	.519	.145	-.017	-.477	-.106
LTY2	.671	.091	.110	-.429	-.050

Extraction Method: Principal Component Analysis.
a. 5 components extracted.

Appendix F: Africa - Factor Loadings (PCA Rotated)

Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
IMG1	.134	.157	.163	.727	.025
STF1	.515	.020	.184	.549	.132
FNC1	.454	.178	.142	.567	.135
FNC2	.535	.131	.064	.371	.075
SQL1	.637	.115	.105	.263	.059
SQL2	.455	.180	.058	.309	-.021
FNC3	.416	.072	.188	.511	-.025
SQL3	.712	.149	.120	.132	-.040
SQL4	.734	.172	.056	.173	.060
SQL5	.710	.167	.092	.173	-.009
SQL6	.612	.258	.080	.107	.048
STF2	.637	.182	.196	.210	.043
STF3	.654	.313	.097	.046	.106
CLT1	.230	.350	.349	.400	-.018
STF4	.611	.282	.201	.178	-.012
VAL1	.559	.334	.122	.265	-.028
VAL2	.514	.376	.164	.263	-.017
STF5	.647	.346	.121	.050	-.030
STF6	.692	.308	.115	-.028	.002
IMG2	.301	.439	.098	.169	-.376
IMG3	.285	.494	.134	.239	-.300
IMG4	.264	.453	.187	.432	-.130
IMG5	.335	.555	.089	.290	-.120
CLT2	.257	.534	-.030	.035	-.066
CLT3	.120	-.004	.533	.142	-.404
CLT4	.245	.589	.120	-.009	.217
CLT5	.140	.694	.107	.100	.123
CLT6	.157	.550	.217	.174	-.043
CLT7	.292	.601	.173	.035	.143
CLT8	.235	.569	.189	.111	.234
CLT9	.095	.300	.631	.128	.064
CLT10	.167	.234	.637	.084	.060
CLT11	.112	-.075	.766	.071	-.079
CLT12	.088	.132	.714	.111	.070
CLT13	.125	.197	.663	.129	.179
LTY1	.270	.219	.265	.267	.516
LTY2	.348	.411	.234	.304	.468

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 8 iterations.

Appendix G: Africa - Factor Loadings (combined and cross)

" Combined loadings and cross-loadings "

Notes: Loadings are unrotated and cross-loadings are oblique-rotated. SEs and P values are for loadings. P values < 0.05 are desirable for reflective indicators.

	Image	Functio	ServQua	Satisfa	Value	Culture	Loyalty	Type (a	SE	P value
IMG1	0.601	0.044	0.400	-0.071	-0.513	0.005	0.127	Reflect	0.049	<0.001
IMG2	0.628	0.027	-0.055	0.244	0.007	0.014	-0.414	Reflect	0.049	<0.001
IMG3	0.750	-0.102	-0.050	0.033	0.205	-0.025	-0.140	Reflect	0.048	<0.001
IMG4	0.795	0.069	-0.199	-0.009	0.169	-0.074	0.145	Reflect	0.048	<0.001
IMG5	0.790	-0.027	-0.013	-0.162	0.022	0.083	0.220	Reflect	0.048	<0.001
FNC1	0.072	0.809	0.099	-0.066	-0.067	0.051	0.125	Reflect	0.048	<0.001
FNC2	0.023	0.809	-0.396	0.037	-0.044	0.006	-0.037	Reflect	0.048	<0.001
FNC3	-0.096	0.796	0.302	0.029	0.113	-0.058	-0.089	Reflect	0.048	<0.001
SQL1	-0.139	0.100	0.809	-0.039	0.080	0.089	-0.090	Reflect	0.048	<0.001
SQL2	0.427	-0.223	0.619	-0.518	-0.177	-0.076	0.147	Reflect	0.049	<0.001
SQL3	-0.087	-0.056	0.817	0.303	-0.177	-0.051	-0.062	Reflect	0.048	<0.001
SQL4	-0.011	0.017	0.842	-0.010	0.080	-0.010	0.074	Reflect	0.048	<0.001
SQL5	-0.026	0.187	0.869	-0.006	-0.029	0.020	0.036	Reflect	0.048	<0.001
SQL6	-0.062	-0.093	0.781	0.152	0.189	0.010	-0.077	Reflect	0.048	<0.001
STF1	0.056	0.319	0.259	0.724	-0.580	-0.075	0.143	Reflect	0.049	<0.001
STF2	-0.140	0.018	0.369	0.794	-0.304	0.098	-0.063	Reflect	0.048	<0.001
STF3	-0.049	-0.140	0.001	0.783	-0.155	0.085	0.178	Reflect	0.048	<0.001
STF4	0.027	-0.011	-0.133	0.808	0.502	-0.043	-0.066	Reflect	0.048	<0.001
STF5	0.161	-0.103	-0.259	0.825	0.153	-0.047	-0.007	Reflect	0.048	<0.001
STF6	-0.054	-0.051	-0.193	0.831	0.301	-0.019	-0.161	Reflect	0.048	<0.001
VAL1	0.040	0.067	-0.055	0.115	0.890	-0.094	-0.051	Reflect	0.047	<0.001
VAL2	-0.040	-0.067	0.055	-0.115	0.890	0.094	0.051	Reflect	0.047	<0.001
CLT1	0.363	-0.260	0.011	0.430	-0.076	0.569	0.087	Reflect	0.050	<0.001
CLT2	0.152	0.110	0.188	-0.696	0.463	0.446	0.062	Reflect	0.051	<0.001
CLT3	0.090	0.136	0.180	0.093	-0.097	0.167	-0.563	Reflect	0.053	<0.001
CLT4	-0.098	-0.118	0.041	-0.113	0.223	0.635	0.253	Reflect	0.049	<0.001
CLT5	0.069	-0.203	0.145	-0.208	0.038	0.647	0.160	Reflect	0.049	<0.001
CLT6	0.231	-0.098	0.167	0.018	-0.251	0.589	0.076	Reflect	0.050	<0.001
CLT7	-0.190	0.036	-0.208	-0.009	0.451	0.690	0.158	Reflect	0.049	<0.001
CLT8	0.033	-0.268	0.203	-0.284	0.344	0.681	0.101	Reflect	0.049	<0.001
CLT9	-0.165	0.135	-0.122	-0.079	-0.083	0.629	-0.035	Reflect	0.049	<0.001
CLT10	-0.229	0.083	0.007	0.040	-0.080	0.570	-0.137	Reflect	0.050	<0.001
CLT11	-0.137	0.259	-0.016	0.212	-0.372	0.412	-0.468	Reflect	0.051	<0.001
CLT12	0.107	0.249	-0.245	0.553	-0.620	0.607	-0.292	Reflect	0.049	<0.001
CLT13	-0.126	0.184	-0.181	0.085	-0.143	0.580	0.001	Reflect	0.050	<0.001
LTY1	-0.094	0.058	-0.020	-0.087	0.035	-0.132	0.909	Reflect	0.047	<0.001
LTY2	0.094	-0.058	0.020	0.087	-0.035	0.132	0.909	Reflect	0.047	<0.001

Appendix H: Africa - Factor Loadings (normalized and cross)

" Normalized combined loadings and cross-loadings "							
Note: Loadings are unrotated and cross-loadings are oblique-rotated, both after separate Kaiser normalizations.							
	Image	Functio	ServQua	Satisfa	Value	Culture	Loyalty
IMG1	0.529	0.047	0.431	-0.077	-0.554	0.006	0.137
IMG2	0.555	0.032	-0.063	0.282	0.008	0.016	-0.478
IMG3	0.553	-0.123	-0.061	0.040	0.246	-0.030	-0.169
IMG4	0.531	0.088	-0.253	-0.011	0.215	-0.094	0.185
IMG5	0.532	-0.035	-0.016	-0.207	0.027	0.106	0.280
FNC1	0.103	0.499	0.142	-0.094	-0.096	0.074	0.180
FNC2	0.019	0.561	-0.320	0.030	-0.036	0.005	-0.030
FNC3	-0.142	0.512	0.447	0.044	0.167	-0.086	-0.132
SQL1	-0.167	0.120	0.511	-0.047	0.097	0.107	-0.109
SQL2	0.328	-0.172	0.530	-0.399	-0.136	-0.058	0.113
SQL3	-0.093	-0.060	0.531	0.323	-0.189	-0.054	-0.066
SQL4	-0.015	0.023	0.493	-0.013	0.106	-0.014	0.099
SQL5	-0.035	0.248	0.494	-0.009	-0.039	0.027	0.047
SQL6	-0.087	-0.130	0.496	0.212	0.263	0.014	-0.108
STF1	0.058	0.329	0.267	0.472	-0.597	-0.077	0.147
STF2	-0.148	0.019	0.389	0.490	-0.321	0.103	-0.067
STF3	-0.053	-0.150	0.002	0.489	-0.167	0.091	0.191
STF4	0.035	-0.014	-0.172	0.468	0.648	-0.055	-0.085
STF5	0.162	-0.104	-0.262	0.486	0.155	-0.048	-0.007
STF6	-0.053	-0.050	-0.188	0.502	0.294	-0.019	-0.157
VAL1	0.046	0.077	-0.063	0.133	0.508	-0.108	-0.058
VAL2	-0.042	-0.070	0.058	-0.122	0.512	0.099	0.053
CLT1	0.557	-0.398	0.016	0.659	-0.117	0.423	0.133
CLT2	0.163	0.117	0.201	-0.745	0.496	0.481	0.066
CLT3	0.133	0.202	0.267	0.139	-0.144	0.549	-0.837
CLT4	-0.151	-0.182	0.064	-0.174	0.344	0.543	0.390
CLT5	0.092	-0.270	0.193	-0.277	0.050	0.610	0.213
CLT6	0.363	-0.153	0.263	0.028	-0.394	0.542	0.119
CLT7	-0.248	0.047	-0.272	-0.012	0.589	0.526	0.207
CLT8	0.040	-0.323	0.244	-0.342	0.416	0.557	0.121
CLT9	-0.179	0.148	-0.133	-0.086	-0.091	0.697	-0.038
CLT10	-0.271	0.098	0.008	0.048	-0.094	0.655	-0.162
CLT11	-0.134	0.255	-0.016	0.209	-0.365	0.796	-0.460
CLT12	0.089	0.207	-0.204	0.460	-0.516	0.640	-0.243
CLT13	-0.162	0.235	-0.231	0.108	-0.183	0.636	0.002
LTY1	-0.088	0.054	-0.019	-0.081	0.033	-0.122	0.630
LTY2	0.121	-0.074	0.026	0.111	-0.045	0.168	0.520

Appendix I: Africa - Factor Loadings (indicator weights)

" Indicator weights "

P values < 0.05 and VIFs < 2.5 are desirable for formative indicators; VIF = indicator variance inflatio
WLS = indicator weight-loading sign (-1 = Simpson's paradox in l.v.); ES = indicator effect size.

	Image	Functio	ServQu	Satisf	Value	Culture	Loyalty	Type (a	SE	P valu	VIF	WLS	ES
IMG1	0.234	0.000	0.000	0.000	0.000	0.000	0.000	Reflec	0.052	<0.001	1.219	1	0.141
IMG2	0.244	0.000	0.000	0.000	0.000	0.000	0.000	Reflec	0.052	<0.001	1.362	1	0.153
IMG3	0.292	0.000	0.000	0.000	0.000	0.000	0.000	Reflec	0.052	<0.001	1.580	1	0.219
IMG4	0.309	0.000	0.000	0.000	0.000	0.000	0.000	Reflec	0.052	<0.001	1.906	1	0.245
IMG5	0.307	0.000	0.000	0.000	0.000	0.000	0.000	Reflec	0.052	<0.001	1.861	1	0.242
FNC1	0.000	0.416	0.000	0.000	0.000	0.000	0.000	Reflec	0.051	<0.001	1.447	1	0.337
FNC2	0.000	0.416	0.000	0.000	0.000	0.000	0.000	Reflec	0.051	<0.001	1.447	1	0.337
FNC3	0.000	0.410	0.000	0.000	0.000	0.000	0.000	Reflec	0.051	<0.001	1.408	1	0.326
SQL1	0.000	0.000	0.214	0.000	0.000	0.000	0.000	Reflec	0.052	<0.001	2.036	1	0.173
SQL2	0.000	0.000	0.164	0.000	0.000	0.000	0.000	Reflec	0.053	0.001	1.361	1	0.101
SQL3	0.000	0.000	0.216	0.000	0.000	0.000	0.000	Reflec	0.052	<0.001	2.141	1	0.177
SQL4	0.000	0.000	0.223	0.000	0.000	0.000	0.000	Reflec	0.052	<0.001	2.368	1	0.188
SQL5	0.000	0.000	0.230	0.000	0.000	0.000	0.000	Reflec	0.052	<0.001	2.787	1	0.200
SQL6	0.000	0.000	0.207	0.000	0.000	0.000	0.000	Reflec	0.052	<0.001	1.970	1	0.161
STF1	0.000	0.000	0.000	0.191	0.000	0.000	0.000	Reflec	0.053	<0.001	1.823	1	0.138
STF2	0.000	0.000	0.000	0.209	0.000	0.000	0.000	Reflec	0.052	<0.001	2.150	1	0.166
STF3	0.000	0.000	0.000	0.207	0.000	0.000	0.000	Reflec	0.052	<0.001	1.921	1	0.162
STF4	0.000	0.000	0.000	0.213	0.000	0.000	0.000	Reflec	0.052	<0.001	2.096	1	0.172
STF5	0.000	0.000	0.000	0.218	0.000	0.000	0.000	Reflec	0.052	<0.001	2.467	1	0.179
STF6	0.000	0.000	0.000	0.219	0.000	0.000	0.000	Reflec	0.052	<0.001	2.624	1	0.182
VAL1	0.000	0.000	0.000	0.000	0.561	0.000	0.000	Reflec	0.050	<0.001	1.523	1	0.500
VAL2	0.000	0.000	0.000	0.000	0.561	0.000	0.000	Reflec	0.050	<0.001	1.523	1	0.500
CLT1	0.000	0.000	0.000	0.000	0.000	0.134	0.000	Reflec	0.053	0.006	1.398	1	0.076
CLT2	0.000	0.000	0.000	0.000	0.000	0.105	0.000	Reflec	0.053	0.025	1.217	1	0.047
CLT3	0.000	0.000	0.000	0.000	0.000	0.039	0.000	Reflec	0.054	0.231	1.161	1	0.007
CLT4	0.000	0.000	0.000	0.000	0.000	0.149	0.000	Reflec	0.053	0.003	1.747	1	0.095
CLT5	0.000	0.000	0.000	0.000	0.000	0.152	0.000	Reflec	0.053	0.002	1.664	1	0.098
CLT6	0.000	0.000	0.000	0.000	0.000	0.138	0.000	Reflec	0.053	0.005	1.444	1	0.081
CLT7	0.000	0.000	0.000	0.000	0.000	0.162	0.000	Reflec	0.053	0.001	2.005	1	0.112
CLT8	0.000	0.000	0.000	0.000	0.000	0.160	0.000	Reflec	0.053	0.001	1.809	1	0.109
CLT9	0.000	0.000	0.000	0.000	0.000	0.148	0.000	Reflec	0.053	0.003	1.723	1	0.093
CLT10	0.000	0.000	0.000	0.000	0.000	0.134	0.000	Reflec	0.053	0.006	1.817	1	0.076
CLT11	0.000	0.000	0.000	0.000	0.000	0.097	0.000	Reflec	0.053	0.034	1.704	1	0.040
CLT12	0.000	0.000	0.000	0.000	0.000	0.143	0.000	Reflec	0.053	0.004	1.703	1	0.087
CLT13	0.000	0.000	0.000	0.000	0.000	0.137	0.000	Reflec	0.053	0.005	1.569	1	0.079
LTY1	0.000	0.000	0.000	0.000	0.000	0.000	0.550	Reflec	0.050	<0.001	1.740	1	0.500
LTY2	0.000	0.000	0.000	0.000	0.000	0.000	0.550	Reflec	0.050	<0.001	1.740	1	0.500

Appendix J: Europe – General SEM Analysis Results

```
General model elements
----------------------

Missing data imputation algorithm: Arithmetic Mean Imputation
Outer model analysis algorithm: PLS Regression
Default inner model analysis algorithm: Warp3
Multiple inner model analysis algorithms used? No
Resampling method used in the analysis: Stable3
Number of data resamples used: 100
Number of cases (rows) in model data: 421
Number of latent variables in model: 7
Number of indicators used in model: 37
Number of iterations to obtain estimates: 7
Range restriction variable type: None
Range restriction variable: None
Range restriction variable min value: 0.000
Range restriction variable max value: 0.000
Only ranked data used in analysis? No
```

```
Model fit and quality indices
-----------------------------

Average path coefficient (APC)=0.310, P<0.001
Average R-squared (ARS)=0.498, P<0.001
Average adjusted R-squared (AARS)=0.495, P<0.001
Average block VIF (AVIF)=2.178, acceptable if <= 5, ideally <= 3.3
Average full collinearity VIF (AFVIF)=2.598, acceptable if <= 5, ideally <= 3.3
Tenenhaus GoF (GoF)=0.539, small >= 0.1, medium >= 0.25, large >= 0.36
Sympson's paradox ratio (SPR)=1.000, acceptable if >= 0.7, ideally = 1
R-squared contribution ratio (RSCR)=1.000, acceptable if >= 0.9, ideally = 1
Statistical suppression ratio (SSR)=1.000, acceptable if >= 0.7
Nonlinear bivariate causality direction ratio (NLBCDR)=1.000, acceptable if >= 0.7
```

```
****************************************
* Standard errors for path coefficients *
****************************************
```

	Image	Functio	Satisfa	ServQua	Value	Culture	Loyalty
Image				0.047		0.045	
Satisfa	0.048			0.045	0.048	0.048	
ServQua		0.045					
Value	0.047			0.046			
Culture				0.045			
Loyalty	0.048		0.048	0.048	0.048	0.047	

```
****************************************
* Effect sizes for path coefficients *
****************************************
```

	Image	Functio	Satisfa	ServQua	Value	Culture	Loyalty
Image				0.207		0.375	
Satisfa	0.056			0.457	0.120	0.103	
ServQua		0.418					
Value	0.161			0.302			
Culture				0.309			
Loyalty	0.091		0.020	0.098	0.054	0.215	

	Image	Function	Satisfac	ServQual	Value	Culture	Loyalty
R-squared	0.582		0.736	0.418	0.463	0.309	0.479
Adj. R-squared	0.580		0.733	0.416	0.460	0.307	0.473
Composite reliab.	0.822	0.837	0.869	0.867	0.876	0.880	0.873
Cronbach's alpha	0.728	0.706	0.818	0.815	0.718	0.852	0.710
Avg. var. extrac.	0.486	0.632	0.525	0.521	0.780	0.364	0.775
Full collin. VIF	2.471	2.059	3.875	3.299	2.100	2.640	1.744
Q-squared	0.581		0.737	0.418	0.459	0.311	0.440
Min	-3.684	-3.500	-3.978	-3.909	-2.856	-2.829	-3.292
Max	0.935	0.779	0.827	0.815	0.824	1.246	0.639
Median	0.413	0.251	0.415	0.430	0.824	0.089	0.639
Mode	0.935	0.779	0.827	0.815	0.824	1.246	0.639
Skewness	-0.933	-1.221	-1.300	-1.184	-0.885	-0.448	-1.323
Exc. kurtosis	0.178	0.826	1.439	0.777	-0.247	-0.688	0.811
Unimodal-RS	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Unimodal-KMV	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Normal-JB	No	No	No	No	No	No	No
Normal-RJB	No	No	No	No	No	No	No
Histogram	View	View	View	View	View	View	View

```
**************************************************
* Correlations among latent variables and errors *
**************************************************

Correlations among l.vs. with sq. rts. of AVEs
----------------------------------------------

         Image   Functio Satisfa ServQua Value   Culture Loyalty
Image    0.697   0.531   0.647   0.612   0.564   0.711   0.556
Functio  0.531   0.795   0.664   0.635   0.556   0.584   0.465
Satisfa  0.647   0.664   0.725   0.813   0.675   0.623   0.515
ServQua  0.612   0.635   0.813   0.722   0.627   0.545   0.510
Value    0.564   0.556   0.675   0.627   0.883   0.586   0.491
Culture  0.711   0.584   0.623   0.545   0.586   0.604   0.601
Loyalty  0.556   0.465   0.515   0.510   0.491   0.601   0.881

Note: Square roots of average variances extracted (AVEs) shown on diagonal.
```

Appendix K: Europe - Factor Loadings (combined and cross)

" Combined loadings and cross-

Notes: Loadings are unrotated and cross-loadings are oblique-rotated, SEs and P values are for loadings, P values < 0,05 are desirable for reflective indicators,

	Image	Functio	Satisfa	ServQua	Value	Culture	Loyalty	Type (a	SE	P value
IMG1	0,495	0,670	-0,219	-0,267	0,135	0,138	0,051	Reflect	0,046	<0,001
IMG2	0,662	-0,293	0,005	0,260	-0,077	-0,057	0,045	Reflect	0,045	<0,001
IMG3	0,736	-0,188	-0,075	0,073	0,069	-0,013	-0,109	Reflect	0,044	<0,001
IMG4	0,766	0,161	0,057	-0,204	-0,093	0,056	-0,007	Reflect	0,044	<0,001
IMG5	0,788	-0,156	0,148	0,080	0,005	-0,081	0,04	Reflect	0,044	<0,001
FNC1	-0,003	0,863	0,144	-0,210	0,025	0,006	0,031	Reflect	0,043	<0,001
FNC2	-0,041	0,776	0,267	0,176	-0,034	-0,218	0,039	Reflect	0,044	<0,001
FNC3	0,046	0,741	-0,448	0,060	0,006	0,221	-0,077	Reflect	0,044	<0,001
STF1	0,045	0,589	0,638	-0,094	-0,004	0,031	-0,041	Reflect	0,045	<0,001
STF2	-0,102	0,014	0,748	-0,035	-0,100	0,101	0,04	Reflect	0,044	<0,001
STF3	-0,049	-0,171	0,741	0,261	0,225	-0,040	-0,07	Reflect	0,044	<0,001
STF4	0,016	0,099	0,719	-0,091	-0,041	0,091	-0,097	Reflect	0,044	<0,001
STF5	0,134	-0,196	0,740	-0,110	-0,056	-0,127	0,117	Reflect	0,044	<0,001
STF6	-0,035	-0,246	0,757	0,053	-0,024	-0,049	0,042	Reflect	0,044	<0,001
SQL1	-0,020	0,063	0,339	0,684	-0,195	0,004	-0,002	Reflect	0,045	<0,001
SQL2	0,088	0,214	-0,298	0,678	0,173	0,032	-0,214	Reflect	0,045	<0,001
SQL3	0,031	-0,103	-0,087	0,764	0,039	0,013	0,043	Reflect	0,044	<0,001
SQL4	-0,064	0,078	-0,022	0,784	-0,002	-0,112	0,101	Reflect	0,044	<0,001
SQL5	0,058	-0,115	0,125	0,734	0,039	-0,034	-0,042	Reflect	0,044	<0,001
SQL6	-0,092	-0,128	-0,056	0,680	-0,059	0,115	0,097	Reflect	0,045	<0,001
VAL1	-0,026	-0,049	-0,067	0,074	0,883	-0,086	0,13	Reflect	0,043	<0,001
VAL2	0,026	0,049	0,067	-0,074	0,883	0,086	-0,13	Reflect	0,043	<0,001
CLT1	0,013	0,259	-0,176	-0,163	0,255	0,679	-0,018	Reflect	0,045	<0,001
CLT2	0,265	-0,349	0,865	-0,183	-0,151	0,445	0,025	Reflect	0,046	<0,001
CLT3	0,167	0,199	-0,186	-0,180	-0,043	0,509	-0,163	Reflect	0,046	<0,001
CLT4	0,070	-0,404	0,502	-0,201	0,150	0,552	0,06	Reflect	0,045	<0,001
CLT5	0,173	-0,165	0,146	0,084	0,028	0,646	0,128	Reflect	0,045	<0,001
CLT6	0,105	0,066	0,052	-0,100	0,098	0,632	-0,025	Reflect	0,045	<0,001
CLT7	0,134	-0,305	0,471	0,121	-0,251	0,608	-0,103	Reflect	0,045	<0,001
CLT8	-0,175	-0,117	0,197	0,041	0,277	0,605	0,032	Reflect	0,045	<0,001
CLT9	-0,020	0,133	-0,138	-0,020	-0,063	0,683	-0,046	Reflect	0,045	<0,001
CLT10	-0,206	0,063	0,140	-0,115	-0,096	0,690	-0,179	Reflect	0,044	<0,001
CLT11	-0,280	0,109	-0,558	0,314	-0,112	0,508	0,02	Reflect	0,046	<0,001
CLT12	-0,069	0,133	-0,763	0,317	-0,064	0,567	0,112	Reflect	0,045	<0,001
CLT13	-0,099	0,234	-0,401	0,087	-0,090	0,665	0,164	Reflect	0,045	<0,001
LTY1	0,026	-0,041	-0,205	0,124	-0,069	0,032	0,881	Reflect	0,043	<0,001
LTY2	-0,026	0,041	0,205	-0,124	0,069	-0,032	0,881	Reflect	0,043	<0,001

Appendix L: Europe - Factor Loadings (normalized and cross)

" Normalized combined loadings and cross-loadings "

Note: Loadings are unrotated and cross-loadings are oblique-rotated, both after separate Kaiser normalizations.

	Image	Functio	Satisfa	ServQua	Value	Culture	Loyalty
IMG1	0.449	0.834	-0.273	-0.333	0.168	0.172	0.063
IMG2	0.581	-0.352	0.006	0.312	-0.092	-0.069	0.054
IMG3	0.602	-0.203	-0.081	0.078	0.075	-0.014	-0.118
IMG4	0.563	0.192	0.068	-0.243	-0.111	0.067	-0.009
IMG5	0.548	-0.197	0.187	0.101	0.007	-0.102	0.050
FNC1	-0.003	0.571	0.156	-0.227	0.027	0.007	0.033
FNC2	-0.058	0.556	0.379	0.249	-0.048	-0.309	0.055
FNC3	0.044	0.609	-0.428	0.057	0.006	0.211	-0.073
STF1	0.068	0.900	0.467	-0.144	-0.006	0.047	-0.063
STF2	-0.122	0.017	0.530	-0.041	-0.119	0.121	0.048
STF3	-0.071	-0.247	0.531	0.378	0.324	-0.058	-0.102
STF4	0.021	0.129	0.518	-0.119	-0.053	0.118	-0.126
STF5	0.134	-0.195	0.537	-0.110	-0.056	-0.127	0.117
STF6	-0.036	-0.250	0.551	0.053	-0.025	-0.050	0.043
SQL1	-0.032	0.100	0.540	0.533	-0.311	0.006	-0.004
SQL2	0.102	0.249	-0.347	0.526	0.201	0.037	-0.249
SQL3	0.037	-0.121	-0.102	0.544	0.046	0.016	0.051
SQL4	-0.077	0.094	-0.027	0.553	-0.003	-0.136	0.122
SQL5	0.082	-0.163	0.177	0.546	0.055	-0.048	-0.060
SQL6	-0.110	-0.154	-0.067	0.549	-0.071	0.139	0.116
VAL1	-0.028	-0.053	-0.072	0.079	0.580	-0.092	0.140
VAL2	0.030	0.056	0.076	-0.084	0.583	0.098	-0.149
CLT1	0.018	0.355	-0.242	-0.224	0.350	0.531	-0.025
CLT2	0.265	-0.349	0.865	-0.183	-0.151	0.425	0.025
CLT3	0.221	0.263	-0.246	-0.238	-0.057	0.621	-0.216
CLT4	0.088	-0.507	0.631	-0.252	0.189	0.522	0.076
CLT5	0.366	-0.349	0.310	0.177	0.060	0.498	0.271
CLT6	0.202	0.129	0.100	-0.194	0.190	0.531	-0.049
CLT7	0.161	-0.367	0.568	0.146	-0.302	0.517	-0.124
CLT8	-0.291	-0.194	0.328	0.068	0.460	0.489	0.053
CLT9	-0.024	0.161	-0.167	-0.024	-0.076	0.584	-0.056
CLT1	-0.202	0.062	0.137	-0.113	-0.095	0.623	-0.176
CLT1	-0.240	0.093	-0.478	0.270	-0.096	0.674	0.017
CLT1	-0.058	0.111	-0.635	0.264	-0.054	0.644	0.094
CLT1	-0.107	0.251	-0.431	0.094	-0.097	0.587	0.175
LTY1	0.026	-0.042	-0.208	0.126	-0.070	0.032	0.660
LTY2	-0.030	0.048	0.242	-0.146	0.081	-0.037	0.571

Appendix M: Europe - Factor Loadings (indicator weights)

" Indicator weights "													
Notes: P values < 0.05 and VIFs < 2.5 are desirable for formative indicators; VIF = indicator variance inflation factor;													
WLS = indicator weight-loading sign (-1 = Simpson's paradox in l.v.); ES = indicator effect size.													
	Image	Functio	Satisfa	ServQua	Value	Culture	Loyalty	Type (a	SE	P value	VIF	WLS	ES
IMG1	0.204	0.000	0.000	0.000	0.000	0.000	0.000	Reflect	0.047	<0.001	1.121	1	0.101
IMG2	0.272	0.000	0.000	0.000	0.000	0.000	0.000	Reflect	0.047	<0.001	1.308	1	0.180
IMG3	0.302	0.000	0.000	0.000	0.000	0.000	0.000	Reflect	0.047	<0.001	1.435	1	0.223
IMG4	0.315	0.000	0.000	0.000	0.000	0.000	0.000	Reflect	0.047	<0.001	1.551	1	0.241
IMG5	0.324	0.000	0.000	0.000	0.000	0.000	0.000	Reflect	0.047	<0.001	1.596	1	0.255
FNC1	0.000	0.455	0.000	0.000	0.000	0.000	0.000	Reflect	0.046	<0.001	1.654	1	0.393
FNC2	0.000	0.409	0.000	0.000	0.000	0.000	0.000	Reflect	0.046	<0.001	1.407	1	0.318
FNC3	0.000	0.391	0.000	0.000	0.000	0.000	0.000	Reflect	0.046	<0.001	1.314	1	0.289
STF1	0.000	0.000	0.202	0.000	0.000	0.000	0.000	Reflect	0.047	<0.001	1.352	1	0.129
STF2	0.000	0.000	0.237	0.000	0.000	0.000	0.000	Reflect	0.047	<0.001	1.623	1	0.178
STF3	0.000	0.000	0.235	0.000	0.000	0.000	0.000	Reflect	0.047	<0.001	1.606	1	0.174
STF4	0.000	0.000	0.228	0.000	0.000	0.000	0.000	Reflect	0.047	<0.001	1.548	1	0.164
STF5	0.000	0.000	0.235	0.000	0.000	0.000	0.000	Reflect	0.047	<0.001	1.686	1	0.174
STF6	0.000	0.000	0.240	0.000	0.000	0.000	0.000	Reflect	0.047	<0.001	1.798	1	0.182
SQL1	0.000	0.000	0.000	0.219	0.000	0.000	0.000	Reflect	0.047	<0.001	1.498	1	0.150
SQL2	0.000	0.000	0.000	0.217	0.000	0.000	0.000	Reflect	0.047	<0.001	1.429	1	0.147
SQL3	0.000	0.000	0.000	0.244	0.000	0.000	0.000	Reflect	0.047	<0.001	1.696	1	0.187
SQL4	0.000	0.000	0.000	0.251	0.000	0.000	0.000	Reflect	0.047	<0.001	1.779	1	0.197
SQL5	0.000	0.000	0.000	0.235	0.000	0.000	0.000	Reflect	0.047	<0.001	1.640	1	0.172
SQL6	0.000	0.000	0.000	0.217	0.000	0.000	0.000	Reflect	0.047	<0.001	1.433	1	0.148
VAL1	0.000	0.000	0.000	0.000	0.566	0.000	0.000	Reflect	0.045	<0.001	1.456	1	0.500
VAL2	0.000	0.000	0.000	0.000	0.566	0.000	0.000	Reflect	0.045	<0.001	1.456	1	0.500
CLT1	0.000	0.000	0.000	0.000	0.000	0.143	0.000	Reflect	0.048	0.001	1.694	1	0.097
CLT2	0.000	0.000	0.000	0.000	0.000	0.094	0.000	Reflect	0.048	0.026	1.412	1	0.042
CLT3	0.000	0.000	0.000	0.000	0.000	0.107	0.000	Reflect	0.048	0.013	1.344	1	0.055
CLT4	0.000	0.000	0.000	0.000	0.000	0.117	0.000	Reflect	0.048	0.008	1.484	1	0.064
CLT5	0.000	0.000	0.000	0.000	0.000	0.136	0.000	Reflect	0.048	0.002	1.822	1	0.088
CLT6	0.000	0.000	0.000	0.000	0.000	0.133	0.000	Reflect	0.048	0.003	1.500	1	0.084
CLT7	0.000	0.000	0.000	0.000	0.000	0.128	0.000	Reflect	0.048	0.004	1.514	1	0.078
CLT8	0.000	0.000	0.000	0.000	0.000	0.128	0.000	Reflect	0.048	0.004	1.546	1	0.077
CLT9	0.000	0.000	0.000	0.000	0.000	0.144	0.000	Reflect	0.048	0.001	1.751	1	0.099
CLT10	0.000	0.000	0.000	0.000	0.000	0.146	0.000	Reflect	0.048	0.001	1.666	1	0.100
CLT11	0.000	0.000	0.000	0.000	0.000	0.107	0.000	Reflect	0.048	0.013	1.549	1	0.054
CLT12	0.000	0.000	0.000	0.000	0.000	0.120	0.000	Reflect	0.048	0.006	1.598	1	0.068
CLT13	0.000	0.000	0.000	0.000	0.000	0.140	0.000	Reflect	0.048	0.002	1.648	1	0.093
LTY1	0.000	0.000	0.000	0.000	0.000	0.000	0.568	Reflect	0.045	<0.001	1.435	1	0.500
LTY2	0.000	0.000	0.000	0.000	0.000	0.000	0.568	Reflect	0.045	<0.001	1.435	1	0.500

Appendix N: NA – General SEM Analysis Results

```
General model elements
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Missing data imputation algorithm: Arithmetic Mean Imputation
Outer model analysis algorithm: PLS Regression
Default inner model analysis algorithm: Warp3
Multiple inner model analysis algorithms used? No
Resampling method used in the analysis: Stable3
Number of data resamples used: 100
Number of cases (rows) in model data: 207
Number of latent variables in model: 7
Number of indicators used in model: 37
Number of iterations to obtain estimates: 6
Range restriction variable type: None
Range restriction variable: None
Range restriction variable min value: 0.000
Range restriction variable max value: 0.000
Only ranked data used in analysis? No
```

```
Model fit and quality indices
-----------------------------

Average path coefficient (APC)=0.297, P<0.001
Average R-squared (ARS)=0.426, P<0.001
Average adjusted R-squared (AARS)=0.419, P<0.001
Average block VIF (AVIF)=1.684, acceptable if <= 5, ideally <= 3.3
Average full collinearity VIF (AFVIF)=2.108, acceptable if <= 5, ideally <= 3.3
Tenenhaus GoF (GoF)=0.486, small >= 0.1, medium >= 0.25, large >= 0.36
Sympson's paradox ratio (SPR)=0.933, acceptable if >= 0.7, ideally = 1
R-squared contribution ratio (RSCR)=0.996, acceptable if >= 0.9, ideally = 1
Statistical suppression ratio (SSR)=1.000, acceptable if >= 0.7
Nonlinear bivariate causality direction ratio (NLBCDR)=0.933, acceptable if >= 0.7
```

```
****************************************
* Standard errors for path coefficients *
****************************************

        ServQua Satisfa Image   Functio Value   Culture Loyalty
ServQua                         0.063
Satisfa 0.064           0.067           0.068   0.068
Image   0.064                           0.066

Value   0.066           0.064
Culture 0.062
Loyalty 0.069   0.068   0.068           0.069   0.062
```

```
*************************************
* Effect sizes for path coefficients *
*************************************

        ServQua Satisfa Image   Functio Value   Culture Loyalty
ServQua                         0.301
Satisfa 0.341           0.099           0.083   0.084
Image   0.291                           0.176

Value   0.121           0.274
Culture 0.332
Loyalty 0.010   0.033   0.028           0.014   0.388
```

	ServQual	Satisfac	Image	Function	Value	Culture	Loyalty
R-squared	0.301	0.607	0.467		0.395	0.332	0.453
Adj. R-squared	0.298	0.600	0.461		0.389	0.328	0.439
Composite reliab.	0.823	0.824	0.810	0.842	0.873	0.863	0.891
Cronbach's alpha	0.742	0.743	0.706	0.718	0.709	0.827	0.756
Avg. var. extrac.	0.438	0.440	0.461	0.640	0.775	0.333	0.804
Full collin. VIF	2.600	2.561	2.152	1.598	1.751	2.482	1.613
Q-squared	0.298	0.610	0.472		0.401	0.334	0.385
Min	-2.954	-3.540	-4.045	-4.227	-3.332	-3.287	-2.457
Max	0.903	0.866	0.870	0.613	0.677	1.227	0.882
Median	0.420	0.398	0.321	0.613	0.677	0.067	0.882
Mode	0.903	0.866	0.870	0.613	0.677	1.227	0.882
Skewness	-0.976	-1.236	-1.484	-1.885	-1.329	-0.642	-0.712
Exc. kurtosis	-0.137	1.082	2.362	3.330	0.973	-0.082	-0.506
Unimodal-RS	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Unimodal-KMV	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Normal-JB	No	No	No	No	No	No	No
Normal-RJB	No	No	No	No	No	No	No
Histogram	View	View	View	View	View	View	View

Appendix O: NA - Factor Loadings (combined and cross)

" Combined loadings and cross-loadings "										
Notes: Loadings are unrotated and cross-loadings are oblique-rotated. SEs and P values are for loadings. P values < 0.05 are desirable for reflective indicators.										
	ServQua	Satisfa	Image	Functio	Value	Culture	Loyalty	Type (a	SE	P value
SQL1	0.573	0.139	-0.090	0.458	0.042	-0.025	0.044	Reflect	0.062	<0.001
SQL2	0.666	-0.353	0.105	-0.051	-0.170	0.016	0.170	Reflect	0.061	<0.001
SQL3	0.699	0.127	-0.088	0.002	0.072	0.229	-0.237	Reflect	0.061	<0.001
SQL4	0.720	0.146	-0.065	-0.072	0.034	-0.142	-0.055	Reflect	0.061	<0.001
SQL5	0.669	0.307	-0.232	-0.127	0.105	-0.185	0.078	Reflect	0.061	<0.001
SQL6	0.633	-0.387	0.387	-0.146	-0.088	0.109	0.024	Reflect	0.062	<0.001
STF1	-0.140	0.616	-0.075	0.416	0.011	-0.246	0.250	Reflect	0.062	<0.001
STF2	-0.313	0.661	0.011	-0.071	0.174	0.173	-0.125	Reflect	0.061	<0.001
STF3	0.252	0.658	-0.031	-0.128	0.003	0.158	-0.253	Reflect	0.061	<0.001
STF4	-0.247	0.761	-0.106	0.003	0.005	0.155	0.052	Reflect	0.060	<0.001
STF5	0.351	0.678	0.214	-0.087	-0.177	-0.129	0.003	Reflect	0.061	<0.001
STF6	0.129	0.592	-0.009	-0.115	-0.012	-0.164	0.090	Reflect	0.062	<0.001
IMG1	-0.183	-0.106	0.641	0.216	-0.050	-0.106	0.144	Reflect	0.062	<0.001
IMG2	-0.002	0.034	0.714	-0.175	-0.077	-0.267	0.151	Reflect	0.061	<0.001
IMG3	0.077	-0.054	0.698	-0.205	0.013	0.056	-0.087	Reflect	0.061	<0.001
IMG4	0.009	-0.034	0.629	0.274	0.088	0.137	-0.009	Reflect	0.062	<0.001
IMG5	0.084	0.146	0.708	-0.061	0.032	0.188	-0.190	Reflect	0.061	<0.001
FNC1	-0.195	0.057	0.041	0.858	-0.044	0.050	0.002	Reflect	0.059	<0.001
FNC2	0.328	-0.087	-0.112	0.761	-0.044	-0.125	0.043	Reflect	0.060	<0.001
FNC3	-0.106	0.022	0.065	0.778	0.092	0.067	-0.044	Reflect	0.060	<0.001
VAL1	-0.057	-0.027	0.045	0.074	0.880	0.060	-0.069	Reflect	0.059	<0.001
VAL2	0.057	0.027	-0.045	-0.074	0.880	-0.060	0.069	Reflect	0.059	<0.001
CLT1	0.121	-0.194	-0.022	0.177	0.347	0.612	0.095	Reflect	0.062	<0.001
CLT2	0.206	-0.013	0.187	-0.071	0.171	0.359	0.067	Reflect	0.065	<0.001
CLT3	-0.199	0.252	-0.264	0.073	-0.006	0.468	-0.353	Reflect	0.064	<0.001
CLT4	0.362	-0.044	-0.175	-0.020	0.017	0.518	-0.371	Reflect	0.063	<0.001
CLT5	-0.170	0.123	0.500	0.006	-0.409	0.464	-0.104	Reflect	0.064	<0.001
CLT6	0.177	-0.101	0.158	-0.147	-0.039	0.586	-0.216	Reflect	0.062	<0.001
CLT7	0.055	0.072	0.203	-0.000	0.021	0.599	-0.015	Reflect	0.062	<0.001
CLT8	-0.053	-0.028	0.425	0.089	-0.208	0.597	0.052	Reflect	0.062	<0.001
CLT9	-0.220	0.003	-0.203	-0.068	0.151	0.721	-0.153	Reflect	0.061	<0.001
CLT10	-0.137	-0.011	0.014	0.057	0.020	0.669	0.083	Reflect	0.061	<0.001
CLT11	-0.137	0.122	-0.154	0.053	0.012	0.499	0.279	Reflect	0.063	<0.001
CLT12	-0.114	0.052	-0.217	-0.065	-0.112	0.601	0.322	Reflect	0.062	<0.001
CLT13	0.172	-0.119	-0.282	-0.075	-0.023	0.696	0.217	Reflect	0.061	<0.001
LTY1	-0.013	0.049	-0.090	0.003	-0.100	0.043	0.897	Reflect	0.059	<0.001
LTY2	0.013	-0.049	0.090	-0.003	0.100	-0.043	0.897	Reflect	0.059	<0.001

Appendix P: NA - Factor Loadings (normalized and cross)

" Normalized combined loadings and cross-loadings "							
Note: Loadings are unrotated and cross-loadings are oblique-rotated, both after separate Kaiser normalizations.							
	ServQua	Satisfa	Image	Functio	Value	Culture	Loyalty
SQL1	0.494	0.257	-0.166	0.842	0.077	-0.046	0.080
SQL2	0.643	-0.341	0.102	-0.050	-0.164	0.016	0.164
SQL3	0.570	0.195	-0.135	0.004	0.110	0.352	-0.364
SQL4	0.613	0.176	-0.078	-0.087	0.041	-0.171	-0.067
SQL5	0.620	0.369	-0.278	-0.152	0.126	-0.222	0.094
SQL6	0.597	-0.413	0.414	-0.157	-0.094	0.116	0.025
STF1	-0.170	0.561	-0.091	0.506	0.013	-0.300	0.305
STF2	-0.354	0.593	0.013	-0.080	0.197	0.196	-0.142
STF3	0.371	0.579	-0.046	-0.189	0.005	0.233	-0.373
STF4	-0.259	0.607	-0.111	0.003	0.005	0.162	0.055
STF5	0.514	0.569	0.312	-0.127	-0.259	-0.188	0.005
STF6	0.185	0.613	-0.013	-0.164	-0.017	-0.234	0.128
IMG1	-0.217	-0.125	0.652	0.256	-0.060	-0.125	0.170
IMG2	-0.002	0.032	0.686	-0.169	-0.074	-0.257	0.146
IMG3	0.094	-0.066	0.647	-0.250	0.016	0.068	-0.106
IMG4	0.018	-0.071	0.512	0.572	0.183	0.286	-0.018
IMG5	0.141	0.246	0.555	-0.102	0.055	0.318	-0.320
FNC1	-0.208	0.061	0.044	0.695	-0.046	0.053	0.002
FNC2	0.387	-0.102	-0.133	0.668	-0.052	-0.147	0.051
FNC3	-0.142	0.029	0.087	0.633	0.123	0.090	-0.060
VAL1	-0.067	-0.032	0.053	0.087	0.645	0.070	-0.081
VAL2	0.061	0.029	-0.048	-0.079	0.661	-0.064	0.074
CLT1	0.210	-0.335	-0.038	0.305	0.600	0.512	0.163
CLT2	0.603	-0.039	0.547	-0.209	0.501	0.444	0.195
CLT3	-0.208	0.262	-0.275	0.076	-0.006	0.653	-0.367
CLT4	0.423	-0.051	-0.204	-0.023	0.020	0.553	-0.433
CLT5	-0.205	0.148	0.604	0.008	-0.494	0.581	-0.126
CLT6	0.234	-0.134	0.210	-0.195	-0.052	0.603	-0.286
CLT7	0.120	0.160	0.448	-0.001	0.047	0.520	-0.032
CLT8	-0.081	-0.043	0.650	0.137	-0.318	0.541	0.080
CLT9	-0.201	0.003	-0.185	-0.062	0.137	0.700	-0.140
CLT10	-0.201	-0.017	0.021	0.083	0.029	0.631	0.121
CLT11	-0.248	0.221	-0.279	0.097	0.022	0.613	0.505
CLT12	-0.147	0.067	-0.279	-0.083	-0.144	0.701	0.413
CLT13	0.200	-0.139	-0.328	-0.088	-0.027	0.678	0.252
LTY1	-0.014	0.053	-0.099	0.003	-0.110	0.047	0.830
LTY2	0.014	-0.054	0.100	-0.003	0.110	-0.048	0.731

Appendix Q: NA - Factor Loadings (indicator weights)

" Indicator weights "													
Notes: P values < 0.05 and VIFs < 2.5 are desirable for formative indicators; VIF = indicator variance inflation factor													
WLS = indicator weight-loading sign (-1 = Simpson's paradox in l.v.); ES = indicator effect size.													
	ServQua	Satisfa	Image	Functio	Value	Culture	Loyalty	Type (a	SE	P value	VIF	WLS	ES
SQL1	0.218	0.000	0.000	0.000	0.000	0.000	0.000	Reflect	0.067	<0.001	1.225	1	0.125
SQL2	0.253	0.000	0.000	0.000	0.000	0.000	0.000	Reflect	0.066	<0.001	1.342	1	0.169
SQL3	0.266	0.000	0.000	0.000	0.000	0.000	0.000	Reflect	0.066	<0.001	1.461	1	0.186
SQL4	0.274	0.000	0.000	0.000	0.000	0.000	0.000	Reflect	0.066	<0.001	1.433	1	0.197
SQL5	0.254	0.000	0.000	0.000	0.000	0.000	0.000	Reflect	0.066	<0.001	1.380	1	0.170
SQL6	0.241	0.000	0.000	0.000	0.000	0.000	0.000	Reflect	0.066	<0.001	1.325	1	0.153
STF1	0.000	0.233	0.000	0.000	0.000	0.000	0.000	Reflect	0.067	<0.001	1.429	1	0.144
STF2	0.000	0.250	0.000	0.000	0.000	0.000	0.000	Reflect	0.066	<0.001	1.339	1	0.166
STF3	0.000	0.249	0.000	0.000	0.000	0.000	0.000	Reflect	0.066	<0.001	1.404	1	0.164
STF4	0.000	0.288	0.000	0.000	0.000	0.000	0.000	Reflect	0.066	<0.001	1.598	1	0.219
STF5	0.000	0.257	0.000	0.000	0.000	0.000	0.000	Reflect	0.066	<0.001	1.364	1	0.174
STF6	0.000	0.224	0.000	0.000	0.000	0.000	0.000	Reflect	0.067	<0.001	1.303	1	0.133
IMG1	0.000	0.000	0.279	0.000	0.000	0.000	0.000	Reflect	0.066	<0.001	1.227	1	0.179
IMG2	0.000	0.000	0.310	0.000	0.000	0.000	0.000	Reflect	0.066	<0.001	1.364	1	0.221
IMG3	0.000	0.000	0.303	0.000	0.000	0.000	0.000	Reflect	0.066	<0.001	1.317	1	0.211
IMG4	0.000	0.000	0.273	0.000	0.000	0.000	0.000	Reflect	0.066	<0.001	1.228	1	0.172
IMG5	0.000	0.000	0.307	0.000	0.000	0.000	0.000	Reflect	0.066	<0.001	1.332	1	0.217
FNC1	0.000	0.000	0.000	0.447	0.000	0.000	0.000	Reflect	0.064	<0.001	1.643	1	0.383
FNC2	0.000	0.000	0.000	0.396	0.000	0.000	0.000	Reflect	0.064	<0.001	1.353	1	0.302
FNC3	0.000	0.000	0.000	0.405	0.000	0.000	0.000	Reflect	0.064	<0.001	1.401	1	0.315
VAL1	0.000	0.000	0.000	0.000	0.568	0.000	0.000	Reflect	0.062	<0.001	1.432	1	0.500
VAL2	0.000	0.000	0.000	0.000	0.568	0.000	0.000	Reflect	0.062	<0.001	1.432	1	0.500
CLT1	0.000	0.000	0.000	0.000	0.000	0.141	0.000	Reflect	0.068	0.019	1.499	1	0.087
CLT2	0.000	0.000	0.000	0.000	0.000	0.083	0.000	Reflect	0.068	0.113	1.351	1	0.030
CLT3	0.000	0.000	0.000	0.000	0.000	0.108	0.000	Reflect	0.068	0.057	1.245	1	0.051
CLT4	0.000	0.000	0.000	0.000	0.000	0.120	0.000	Reflect	0.068	0.040	1.521	1	0.062
CLT5	0.000	0.000	0.000	0.000	0.000	0.108	0.000	Reflect	0.068	0.058	1.320	1	0.050
CLT6	0.000	0.000	0.000	0.000	0.000	0.136	0.000	Reflect	0.068	0.023	1.616	1	0.079
CLT7	0.000	0.000	0.000	0.000	0.000	0.139	0.000	Reflect	0.068	0.021	1.456	1	0.083
CLT8	0.000	0.000	0.000	0.000	0.000	0.138	0.000	Reflect	0.068	0.021	1.452	1	0.083
CLT9	0.000	0.000	0.000	0.000	0.000	0.166	0.000	Reflect	0.067	0.007	1.961	1	0.120
CLT10	0.000	0.000	0.000	0.000	0.000	0.155	0.000	Reflect	0.068	0.011	1.692	1	0.103
CLT11	0.000	0.000	0.000	0.000	0.000	0.115	0.000	Reflect	0.068	0.046	1.545	1	0.057
CLT12	0.000	0.000	0.000	0.000	0.000	0.139	0.000	Reflect	0.068	0.021	1.750	1	0.083
CLT13	0.000	0.000	0.000	0.000	0.000	0.161	0.000	Reflect	0.067	0.009	2.057	1	0.112
LTY1	0.000	0.000	0.000	0.000	0.000	0.000	0.558	Reflect	0.063	<0.001	1.587	1	0.500
LTY2	0.000	0.000	0.000	0.000	0.000	0.000	0.558	Reflect	0.063	<0.001	1.587	1	0.500

Appendix R: Combined – General SEM Analysis Results

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General model elements
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Missing data imputation algorithm: Arithmetic Mean Imputation
Outer model analysis algorithm: PLS Regression
Default inner model analysis algorithm: Warp3
Multiple inner model analysis algorithms used? No
Resampling method used in the analysis: Stable3
Number of data resamples used: 100
Number of cases (rows) in model data: 971
Number of latent variables in model: 7
Number of indicators used in model: 37
Number of iterations to obtain estimates: 7
Range restriction variable type: None
Range restriction variable: None
Range restriction variable min value: 0.000
Range restriction variable max value: 0.000
Only ranked data used in analysis? No
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Model fit and quality indices
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Average path coefficient (APC)=0.305, P<0.001
Average R-squared (ARS)=0.490, P<0.001
Average adjusted R-squared (AARS)=0.489, P<0.001
Average block VIF (AVIF)=2.167, acceptable if <= 5, ideally <= 3.3
Average full collinearity VIF (AFVIF)=2.572, acceptable if <= 5, ideally <= 3.3
Tenenhaus GoF (GoF)=0.541, small >= 0.1, medium >= 0.25, large >= 0.36
Sympson's paradox ratio (SPR)=1.000, acceptable if >= 0.7, ideally = 1
R-squared contribution ratio (RSCR)=1.000, acceptable if >= 0.9, ideally = 1
Statistical suppression ratio (SSR)=1.000, acceptable if >= 0.7
Nonlinear bivariate causality direction ratio (NLBCDR)=1.000, acceptable if >= 0.7
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****************************************
* Standard errors for path coefficients *
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	Image	Functio	ServQua	Satisfa	Value	Culture	Loyalty
Image			0.031			0.031	
ServQua		0.030					
Satisfa	0.032		0.031		0.031	0.032	
Value	0.031		0.031				
Culture			0.031				
Loyalty	0.032		0.032	0.032	0.032	0.031	

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****************************************
* Effect sizes for path coefficients *
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	Image	Functio	ServQua	Satisfa	Value	Culture	Loyalty
Image			0.241			0.291	
ServQua		0.472					
Satisfa	0.070		0.424		0.157	0.092	
Value	0.216		0.293				
Culture			0.303				
Loyalty	0.033		0.050	0.098	0.034	0.167	

	Image	Functio	ServQua	Satisfa	Value	Culture	Loyalty
R-squared coefficients	0.532		0.472	0.744	0.508	0.303	0.382
Adjusted R-squared coefficients	0.531		0.471	0.743	0.507	0.302	0.379
Composite reliability coefficients	0.828	0.841	0.880	0.884	0.880	0.870	0.895
Cronbach's alpha coefficients	0.740	0.716	0.836	0.843	0.726	0.837	0.766
Average variances extracted	0.494	0.639	0.552	0.560	0.785	0.344	0.810
Full collinearity VIFs	2.317	2.198	3.353	4.025	2.328	2.171	1.613
Q-squared coefficients	0.532		0.471	0.743	0.508	0.303	0.384
Minimum and maximum values	-3.652	-3.413	-3.537	-3.500	-2.768	-3.705	-2.551
	0.935	0.762	0.835	0.858	0.785	1.320	0.754
Medians (top) and modes (bottom)	0.439	0.762	0.455	0.481	0.785	0.107	0.754
	0.935	0.762	0.835	0.858	0.785	1.320	0.754
Skewness (top) and exc. kurtosis (bottom) coefficients	-1.114	-1.293	-1.238	-1.247	-1.086	-0.554	-1.032
	0.737	1.045	1.006	1.184	0.274	-0.101	0.031

Appendix S: Combined - Factor Loadings (combined and cross)

" Combined loadings and cross-loadings "

Notes: Loadings are unrotated and cross-loadings are oblique-rotated. SEs and P values are for loadings. P values < 0.05 are desirable for reflective indicators.

	Image	Functio	ServQua	Satisfa	Value	Culture	Loyalty	Type (a	SE	P value
IMG1	0.569	0.537	-0.119	-0.224	-0.021	0.045	0.057	Reflect	0.031	<0.001
IMG2	0.659	-0.207	0.132	0.089	-0.098	-0.029	-0.107	Reflect	0.030	<0.001
IMG3	0.737	-0.229	0.078	-0.009	0.064	-0.012	-0.047	Reflect	0.030	<0.001
IMG4	0.757	0.144	-0.198	0.044	0.028	0.007	0.072	Reflect	0.030	<0.001
IMG5	0.772	-0.142	0.095	0.055	0.010	-0.004	0.024	Reflect	0.030	<0.001
FNC1	0.027	0.843	-0.128	0.071	0.001	0.006	0.063	Reflect	0.030	<0.001
FNC2	0.007	0.788	0.048	0.158	-0.103	-0.096	0.017	Reflect	0.030	<0.001
FNC3	-0.037	0.764	0.092	-0.241	0.105	0.093	-0.086	Reflect	0.030	<0.001
SQL1	-0.087	0.181	0.722	0.158	-0.078	0.024	-0.021	Reflect	0.030	<0.001
SQL2	0.179	0.049	0.648	-0.485	-0.014	0.020	0.022	Reflect	0.030	<0.001
SQL3	-0.041	-0.048	0.778	0.060	-0.010	0.028	-0.048	Reflect	0.030	<0.001
SQL4	-0.025	0.001	0.800	0.104	0.024	-0.073	0.022	Reflect	0.030	<0.001
SQL5	-0.008	-0.008	0.781	0.115	0.020	-0.048	0.010	Reflect	0.030	<0.001
SQL6	0.008	-0.166	0.718	-0.027	0.054	0.060	0.018	Reflect	0.030	<0.001
STF1	-0.017	0.564	-0.047	0.681	-0.186	-0.048	0.107	Reflect	0.030	<0.001
STF2	-0.119	0.059	0.098	0.758	-0.037	0.107	-0.069	Reflect	0.030	<0.001
STF3	-0.029	-0.203	0.161	0.748	0.048	0.010	-0.001	Reflect	0.030	<0.001
STF4	-0.013	0.027	-0.140	0.766	0.135	0.045	-0.005	Reflect	0.030	<0.001
STF5	0.190	-0.199	-0.047	0.766	-0.027	-0.085	0.023	Reflect	0.030	<0.001
STF6	-0.015	-0.187	-0.026	0.770	0.047	-0.033	-0.043	Reflect	0.030	<0.001
VAL1	0.017	0.004	0.018	0.003	0.886	-0.068	0.040	Reflect	0.030	<0.001
VAL2	-0.017	-0.004	-0.018	-0.003	0.886	0.068	-0.040	Reflect	0.030	<0.001
CLT1	0.143	0.164	-0.133	-0.091	0.275	0.623	0.052	Reflect	0.030	<0.001
CLT2	0.309	-0.254	0.127	0.164	0.077	0.416	-0.015	Reflect	0.031	<0.001
CLT3	-0.017	0.231	-0.085	-0.009	-0.115	0.399	-0.286	Reflect	0.031	<0.001
CLT4	0.010	-0.293	0.106	0.193	0.138	0.570	0.018	Reflect	0.031	<0.001
CLT5	0.241	-0.162	0.079	0.025	-0.028	0.607	0.026	Reflect	0.030	<0.001
CLT6	0.187	-0.044	0.075	-0.066	0.038	0.600	-0.052	Reflect	0.030	<0.001
CLT7	0.094	-0.202	-0.001	0.343	0.009	0.630	-0.013	Reflect	0.030	<0.001
CLT8	0.026	-0.135	0.092	0.011	0.189	0.625	0.048	Reflect	0.030	<0.001
CLT9	-0.143	0.068	-0.080	-0.098	-0.013	0.676	-0.024	Reflect	0.030	<0.001
CLT10	-0.207	0.112	-0.104	0.069	-0.079	0.655	-0.076	Reflect	0.030	<0.001
CLT11	-0.280	0.220	-0.002	-0.135	-0.200	0.499	-0.050	Reflect	0.031	<0.001
CLT12	-0.093	0.156	-0.072	-0.103	-0.269	0.602	0.095	Reflect	0.030	<0.001
CLT13	-0.190	0.142	0.032	-0.259	-0.067	0.642	0.163	Reflect	0.030	<0.001
LTY1	-0.040	0.012	0.042	-0.086	-0.054	-0.040	0.900	Reflect	0.030	<0.001
LTY2	0.040	-0.012	-0.042	0.086	0.054	0.040	0.900	Reflect	0.030	<0.001

Appendix T: Combined - Factor Loadings (normalized and cross)

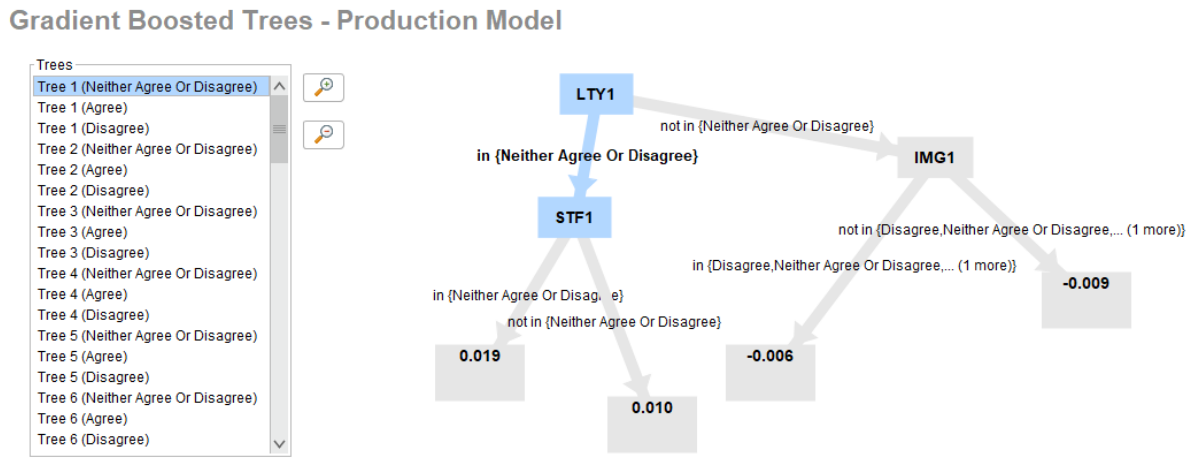
" Normalized combined loadings and cross-loadings "							
Note: Loadings are unrotated and cross-loadings are oblique-rotated, both after separate Kaiser normalizations.							
	Image	Functio	ServQua	Satisfa	Value	Culture	Loyalty
IMG1	0.513	0.741	-0.164	-0.310	-0.030	0.063	0.078
IMG2	0.590	-0.245	0.156	0.105	-0.116	-0.035	-0.126
IMG3	0.587	-0.263	0.090	-0.011	0.074	-0.014	-0.054
IMG4	0.544	0.191	-0.264	0.059	0.038	0.009	0.095
IMG5	0.548	-0.186	0.125	0.072	0.014	-0.005	0.031
FNC1	0.031	0.554	-0.150	0.083	0.001	0.007	0.073
FNC2	0.010	0.571	0.063	0.209	-0.136	-0.127	0.022
FNC3	-0.042	0.577	0.103	-0.272	0.119	0.105	-0.097
SQL1	-0.141	0.292	0.521	0.254	-0.126	0.039	-0.034
SQL2	0.172	0.047	0.547	-0.466	-0.014	0.019	0.021
SQL3	-0.050	-0.059	0.544	0.074	-0.012	0.035	-0.059
SQL4	-0.034	0.001	0.534	0.138	0.031	-0.097	0.029
SQL5	-0.011	-0.012	0.531	0.162	0.029	-0.067	0.015
SQL6	0.009	-0.208	0.533	-0.034	0.068	0.075	0.022
STF1	-0.023	0.765	-0.063	0.483	-0.253	-0.065	0.145
STF2	-0.161	0.079	0.132	0.519	-0.050	0.145	-0.094
STF3	-0.036	-0.259	0.206	0.522	0.062	0.013	-0.001
STF4	-0.017	0.034	-0.181	0.507	0.175	0.058	-0.007
STF5	0.203	-0.212	-0.050	0.521	-0.029	-0.091	0.024
STF6	-0.016	-0.191	-0.026	0.536	0.048	-0.034	-0.043
VAL1	0.020	0.005	0.020	0.003	0.556	-0.077	0.046
VAL2	-0.019	-0.004	-0.020	-0.003	0.558	0.075	-0.045
CLT1	0.267	0.305	-0.248	-0.169	0.512	0.484	0.097
CLT2	0.659	-0.542	0.271	0.351	0.165	0.448	-0.032
CLT3	-0.024	0.325	-0.120	-0.013	-0.162	0.635	-0.402
CLT4	0.016	-0.506	0.182	0.332	0.238	0.531	0.030
CLT5	0.444	-0.298	0.146	0.046	-0.051	0.551	0.049
CLT6	0.347	-0.081	0.140	-0.122	0.070	0.548	-0.097
CLT7	0.157	-0.337	-0.002	0.574	0.014	0.519	-0.022
CLT8	0.049	-0.255	0.173	0.020	0.356	0.525	0.089
CLT9	-0.158	0.075	-0.088	-0.108	-0.014	0.648	-0.026
CLT10	-0.229	0.124	-0.115	0.077	-0.088	0.632	-0.084
CLT11	-0.296	0.232	-0.003	-0.142	-0.212	0.698	-0.053
CLT12	-0.104	0.175	-0.081	-0.115	-0.301	0.657	0.107
CLT13	-0.211	0.158	0.035	-0.288	-0.075	0.626	0.182
LTY1	-0.040	0.012	0.042	-0.086	-0.054	-0.039	0.686
LTY2	0.050	-0.015	-0.052	0.106	0.067	0.049	0.579

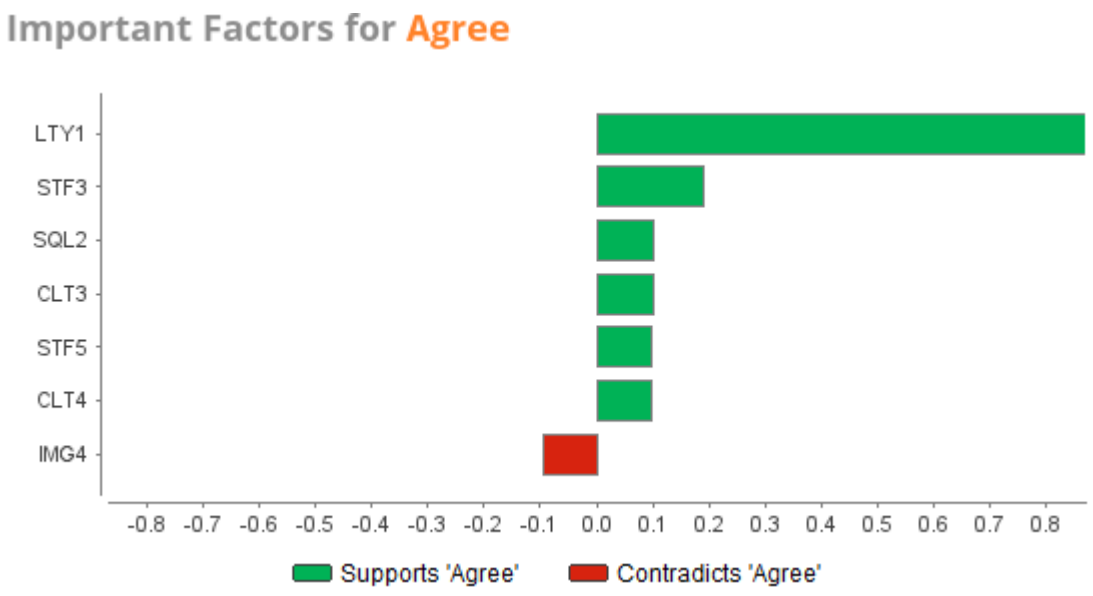
Appendix U: Combined - Factor Loadings (indicator weights)

" Indicator weights "													
Notes: P values < 0.05 and VIFs < 2.5 are desirable for formative indicators; VIF = indicator variance inflation factor;													
WLS = indicator weight-loading sign (-1 = Simpson's paradox in l.v.); ES = indicator effect size.													
	Image	Functio	ServQua	Satisfa	Value	Culture	Loyalty	Type (a	SE	P value	VIF	WLS	ES
IMG1	0.231	0.000	0.000	0.000	0.000	0.000	0.000	Reflect	0.031	<0.001	1.175	1	0.131
IMG2	0.267	0.000	0.000	0.000	0.000	0.000	0.000	Reflect	0.031	<0.001	1.320	1	0.176
IMG3	0.298	0.000	0.000	0.000	0.000	0.000	0.000	Reflect	0.031	<0.001	1.453	1	0.220
IMG4	0.306	0.000	0.000	0.000	0.000	0.000	0.000	Reflect	0.031	<0.001	1.566	1	0.232
IMG5	0.312	0.000	0.000	0.000	0.000	0.000	0.000	Reflect	0.031	<0.001	1.581	1	0.241
FNC1	0.000	0.440	0.000	0.000	0.000	0.000	0.000	Reflect	0.031	<0.001	1.564	1	0.371
FNC2	0.000	0.411	0.000	0.000	0.000	0.000	0.000	Reflect	0.031	<0.001	1.403	1	0.324
FNC3	0.000	0.399	0.000	0.000	0.000	0.000	0.000	Reflect	0.031	<0.001	1.337	1	0.305
SQL1	0.000	0.000	0.218	0.000	0.000	0.000	0.000	Reflect	0.031	<0.001	1.552	1	0.157
SQL2	0.000	0.000	0.196	0.000	0.000	0.000	0.000	Reflect	0.032	<0.001	1.356	1	0.127
SQL3	0.000	0.000	0.235	0.000	0.000	0.000	0.000	Reflect	0.031	<0.001	1.763	1	0.183
SQL4	0.000	0.000	0.242	0.000	0.000	0.000	0.000	Reflect	0.031	<0.001	1.885	1	0.193
SQL5	0.000	0.000	0.236	0.000	0.000	0.000	0.000	Reflect	0.031	<0.001	1.807	1	0.184
SQL6	0.000	0.000	0.217	0.000	0.000	0.000	0.000	Reflect	0.031	<0.001	1.530	1	0.156
STF1	0.000	0.000	0.000	0.202	0.000	0.000	0.000	Reflect	0.032	<0.001	1.494	1	0.138
STF2	0.000	0.000	0.000	0.225	0.000	0.000	0.000	Reflect	0.031	<0.001	1.725	1	0.171
STF3	0.000	0.000	0.000	0.223	0.000	0.000	0.000	Reflect	0.031	<0.001	1.660	1	0.167
STF4	0.000	0.000	0.000	0.228	0.000	0.000	0.000	Reflect	0.031	<0.001	1.708	1	0.174
STF5	0.000	0.000	0.000	0.228	0.000	0.000	0.000	Reflect	0.031	<0.001	1.811	1	0.174
STF6	0.000	0.000	0.000	0.229	0.000	0.000	0.000	Reflect	0.031	<0.001	1.880	1	0.176
VAL1	0.000	0.000	0.000	0.000	0.564	0.000	0.000	Reflect	0.031	<0.001	1.482	1	0.500
VAL2	0.000	0.000	0.000	0.000	0.564	0.000	0.000	Reflect	0.031	<0.001	1.482	1	0.500
CLT1	0.000	0.000	0.000	0.000	0.000	0.139	0.000	Reflect	0.032	<0.001	1.418	1	0.087
CLT2	0.000	0.000	0.000	0.000	0.000	0.093	0.000	Reflect	0.032	0.002	1.247	1	0.039
CLT3	0.000	0.000	0.000	0.000	0.000	0.089	0.000	Reflect	0.032	0.003	1.210	1	0.036
CLT4	0.000	0.000	0.000	0.000	0.000	0.127	0.000	Reflect	0.032	<0.001	1.459	1	0.073
CLT5	0.000	0.000	0.000	0.000	0.000	0.136	0.000	Reflect	0.032	<0.001	1.587	1	0.082
CLT6	0.000	0.000	0.000	0.000	0.000	0.134	0.000	Reflect	0.032	<0.001	1.424	1	0.080
CLT7	0.000	0.000	0.000	0.000	0.000	0.141	0.000	Reflect	0.032	<0.001	1.600	1	0.089
CLT8	0.000	0.000	0.000	0.000	0.000	0.140	0.000	Reflect	0.032	<0.001	1.531	1	0.087
CLT9	0.000	0.000	0.000	0.000	0.000	0.151	0.000	Reflect	0.032	<0.001	1.673	1	0.102
CLT10	0.000	0.000	0.000	0.000	0.000	0.147	0.000	Reflect	0.032	<0.001	1.659	1	0.096
CLT11	0.000	0.000	0.000	0.000	0.000	0.112	0.000	Reflect	0.032	<0.001	1.547	1	0.056
CLT12	0.000	0.000	0.000	0.000	0.000	0.135	0.000	Reflect	0.032	<0.001	1.625	1	0.081
CLT13	0.000	0.000	0.000	0.000	0.000	0.144	0.000	Reflect	0.032	<0.001	1.628	1	0.092
LTY1	0.000	0.000	0.000	0.000	0.000	0.000	0.555	Reflect	0.031	<0.001	1.626	1	0.500
LTY2	0.000	0.000	0.000	0.000	0.000	0.000	0.555	Reflect	0.031	<0.001	1.626	1	0.500

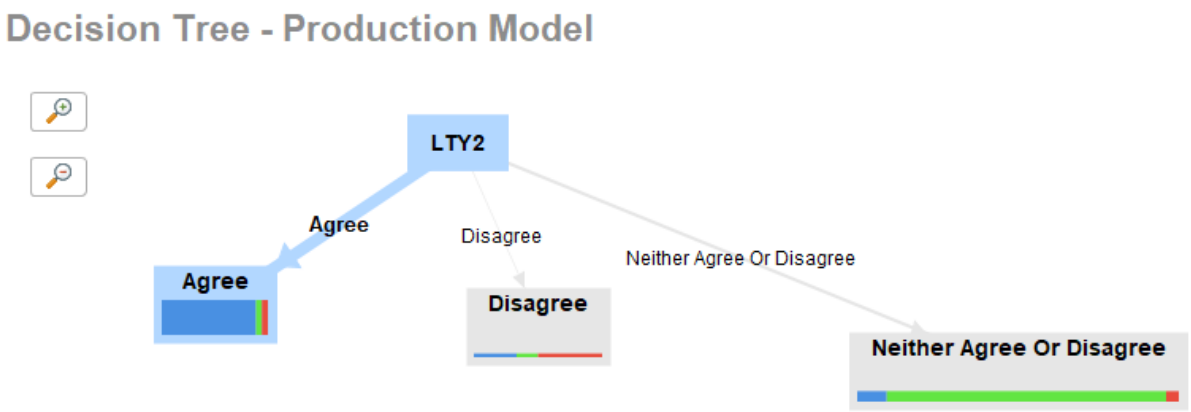
Appendix U: Africa – Production Model [LTY1]

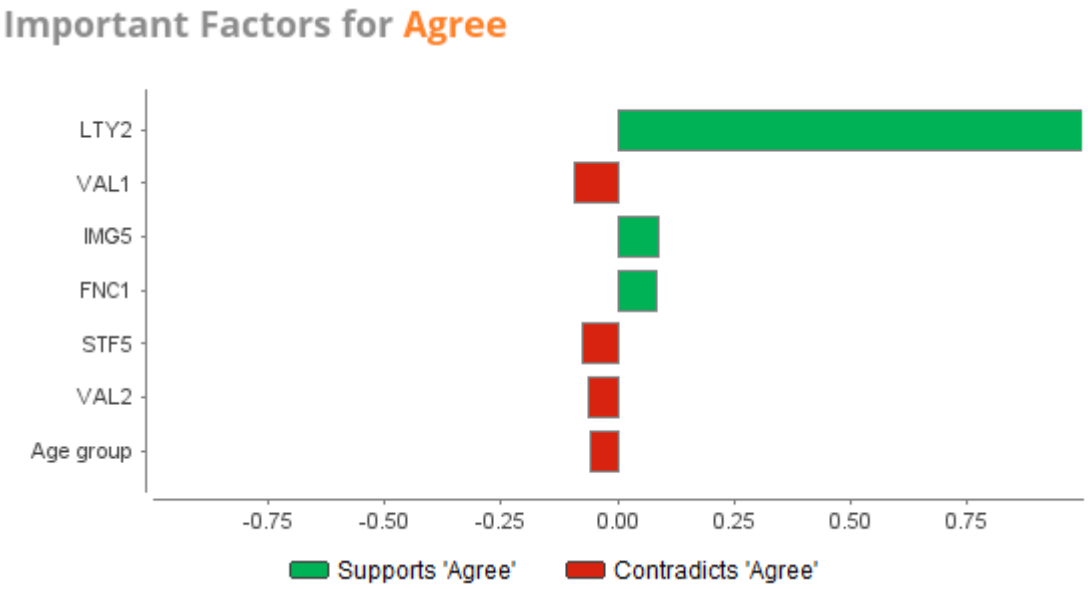
Appendix U: Africa – Production Model [LTY2]





Appendix V: Europe – Production Model [LTY1]



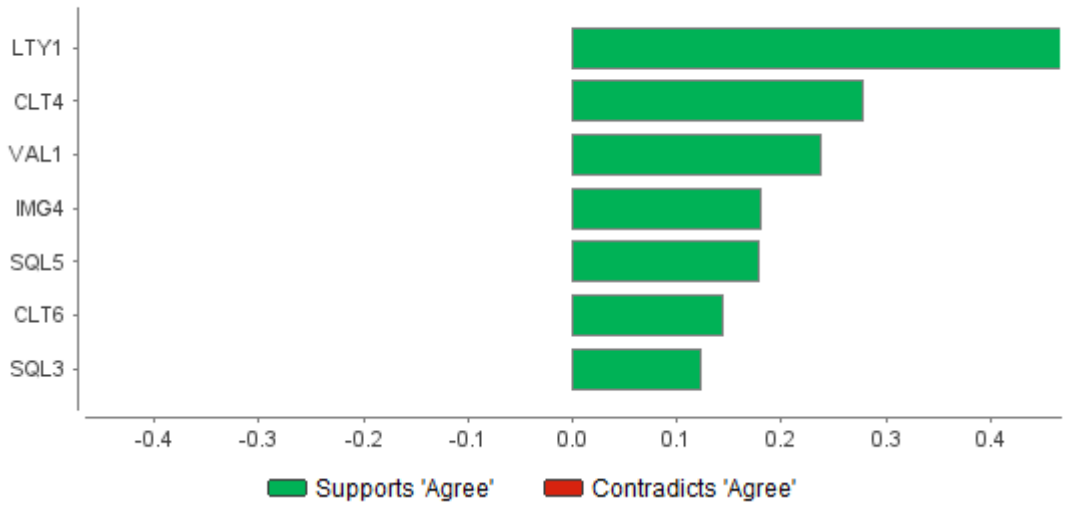


Appendix W: Europe – Production Model [LTY2]

Generalized Linear Model - Production Model

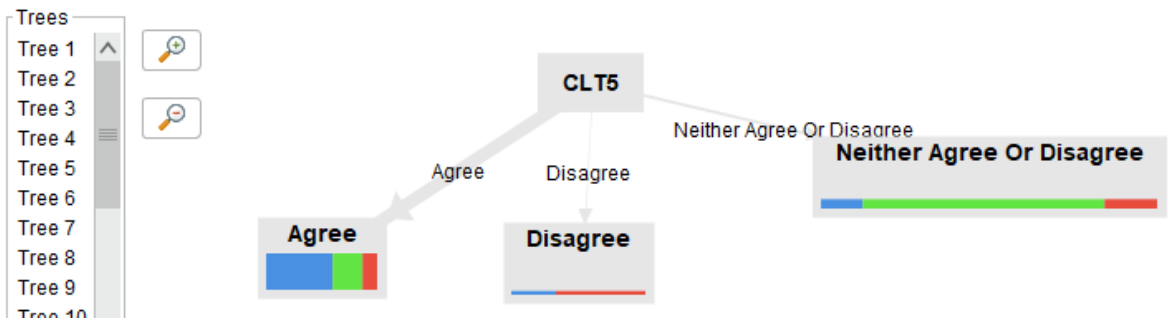
Attribute	Coefficient Agree	Coefficient Neither A...	Coefficient Disagree	Std. Coefficient Agree	Std. Coefficient Neith...	Std. Coefficient Disa...
CLT12.MISSING	0	0	0	0	0	0
CLT13.Agree	0.281	0	0	0.281	0	0
CLT13.Disagree	0	0	0	0	0	0
CLT13.Neither Agree ...	0	0.170	0	0	0.170	0
CLT13.MISSING	0	0	0	0	0	0
LTY1.Agree	0.656	-0.284	0	0.656	-0.284	0
LTY1.Disagree	0	0	0	0	0	0
LTY1.Neither Agree Or...	-0.495	0.983	0	-0.495	0.983	0
LTY1.MISSING	0	0	0	0	0	0
Intercept	-2.230	-2.390	-3.104	-2.230	-2.390	-3.104

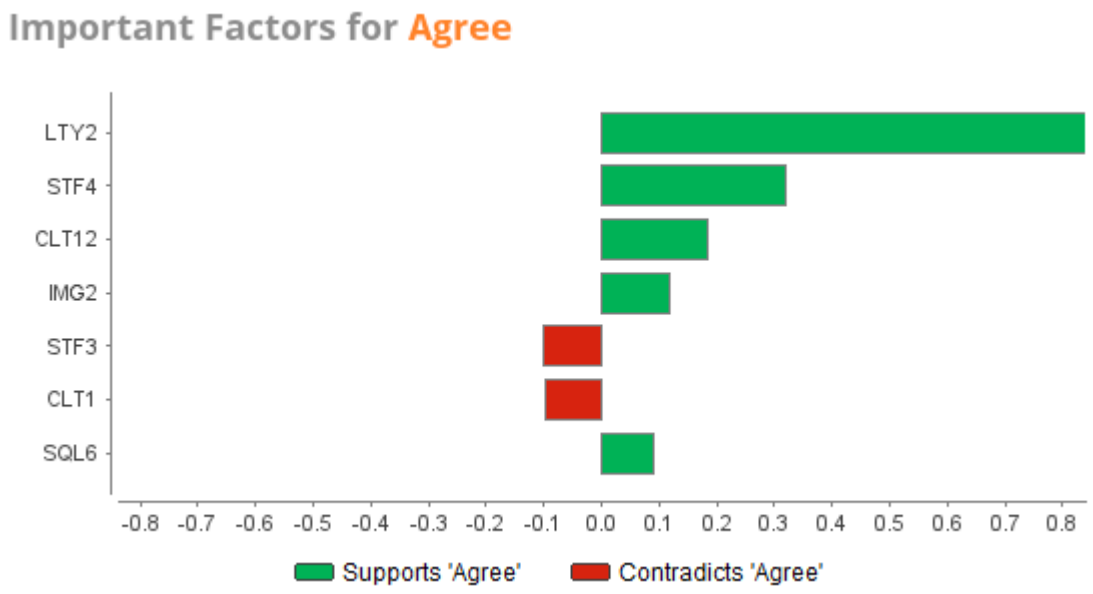
Important Factors for Agree



Appendix X: NA – Production Model [LTY1]

Random Forest - Production Model





Appendix Y: NA – Production Model [LTY2]

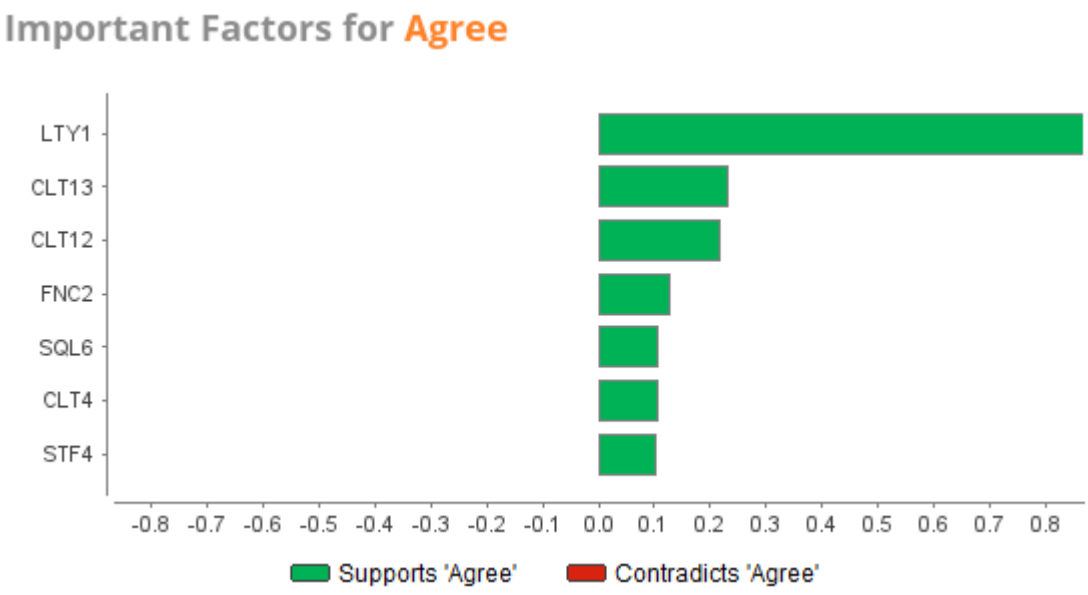
Random Forest

```
1) Tree
---

CLT5 = Agree
|   CLT6 = Agree
|   |   IMG4 = Agree
|   |   |   SQL1 = Agree
|   |   |   |   CLT13 = Agree: Agree {Agree=57, Disagree=0, Neither Agree Or
Disagree=0}
|   |   |   |   CLT13 = Disagree
|   |   |   |   |   STF4 = Agree: Agree {Agree=2, Disagree=0, Neither Agree
Or Disagree=0}
|   |   |   |   |   STF4 = Disagree: Neither Agree Or Disagree {Agree=0,
Disagree=0, Neither Agree Or Disagree=2}
|   |   |   |   CLT13 = Neither Agree Or Disagree
|   |   |   |   |   SQL4 = Agree: Agree {Agree=6, Disagree=0, Neither Agree
Or Disagree=1}
|   |   |   |   |   SQL4 = Neither Agree Or Disagree: Neither Agree Or
Disagree {Agree=0, Disagree=0, Neither Agree Or Disagree=1}
|   |   |   SQL1 = Disagree: Agree {Agree=3, Disagree=0, Neither Agree Or
Disagree=0}
|   |   |   SQL1 = Neither Agree Or Disagree
|   |   |   |   STF2 = Agree: Disagree {Agree=0, Disagree=2, Neither Agree
Or Disagree=0}
|   |   |   |   STF2 = Neither Agree Or Disagree
|   |   |   |   |   Experience using mobile telecom = Between 1 and 2 years:
Agree {Agree=2, Disagree=0, Neither Agree Or Disagree=0}
|   |   |   |   |   Experience using mobile telecom = Between 2 and 5 years:
Neither Agree Or Disagree {Agree=0, Disagree=0, Neither Agree Or Disagree=2}
|   |   |   |   |   Experience using mobile telecom = Between 5 and 10 years:
Agree {Agree=1, Disagree=0, Neither Agree Or Disagree=0}
|   |   IMG4 = Disagree: Neither Agree Or Disagree {Agree=0, Disagree=0,
Neither Agree Or Disagree=6}
|   |   IMG4 = Neither Agree Or Disagree
```

```
|   |   |   STF6 = Agree
|   |   |   |   STF3 = Agree: Agree {Agree=11, Disagree=0, Neither Agree Or
Disagree=0}
|   |   |   |   STF3 = Neither Agree Or Disagree
|   |   |   |   |   STF4 = Agree: Agree {Agree=1, Disagree=0, Neither Agree
Or Disagree=0}
|   |   |   |   |   STF4 = Neither Agree Or Disagree: Neither Agree Or
Disagree {Agree=0, Disagree=0, Neither Agree Or Disagree=2}
|   |   |   STF6 = Neither Agree Or Disagree: Neither Agree Or Disagree
{Agree=0, Disagree=0, Neither Agree Or Disagree=3}
|   CLT6 = Disagree: Neither Agree Or Disagree {Agree=0, Disagree=0, Neither
Agree Or Disagree=3}
|   CLT6 = Neither Agree Or Disagree
|   |   CLT9 = Agree
|   |   |   STF3 = Agree
|   |   |   |   Age group = 18 - 25: Neither Agree Or Disagree {Agree=0,
Disagree=0, Neither Agree Or Disagree=2}
|   |   |   |   Age group = 34 - 41: Neither Agree Or Disagree {Agree=0,
Disagree=0, Neither Agree Or Disagree=3}
|   |   |   |   Age group = 50 +: Agree {Agree=1, Disagree=0, Neither Agree
Or Disagree=0}
|   |   |   STF3 = Neither Agree Or Disagree: Agree {Agree=11, Disagree=0,
Neither Agree Or Disagree=0}
|   |   CLT9 = Disagree: Disagree {Agree=0, Disagree=1, Neither Agree Or
Disagree=0}
|   |   CLT9 = Neither Agree Or Disagree
|   |   |   CLT10 = Agree
|   |   |   |   VAL2 = Agree: Agree {Agree=2, Disagree=0, Neither Agree Or
Disagree=0}
|   |   |   |   VAL2 = Disagree: Neither Agree Or Disagree {Agree=0,
Disagree=0, Neither Agree Or Disagree=2}
|   |   |   |   VAL2 = Neither Agree Or Disagree: Neither Agree Or Disagree
{Agree=0, Disagree=0, Neither Agree Or Disagree=4}
|   |   |   CLT10 = Neither Agree Or Disagree
|   |   |   |   IMG1 = Agree: Disagree {Agree=0, Disagree=3, Neither Agree
Or Disagree=0}
|   |   |   |   IMG1 = Neither Agree Or Disagree: Neither Agree Or Disagree
{Agree=0, Disagree=0, Neither Agree Or Disagree=1}
CLT5 = Disagree
|   Experience using mobile telecom = Between 1 and 2 years: Agree {Agree=6,
Disagree=0, Neither Agree Or Disagree=0}
|   Experience using mobile telecom = Between 5 and 10 years: Disagree
{Agree=0, Disagree=3, Neither Agree Or Disagree=0}
|   Experience using mobile telecom = More than 10 years: Disagree {Agree=0,
Disagree=1, Neither Agree Or Disagree=0}
CLT5 = Neither Agree Or Disagree
|   IMG5 = Agree
|   |   CLT12 = Agree
|   |   |   CLT11 = Agree: Agree {Agree=3, Disagree=0, Neither Agree Or
Disagree=0}
|   |   |   CLT11 = Disagree: Agree {Agree=1, Disagree=0, Neither Agree Or
Disagree=0}
|   |   |   CLT11 = Neither Agree Or Disagree: Neither Agree Or Disagree
{Agree=0, Disagree=0, Neither Agree Or Disagree=1}
|   |   CLT12 = Disagree: Neither Agree Or Disagree {Agree=0, Disagree=0,
Neither Agree Or Disagree=4}
|   |   CLT12 = Neither Agree Or Disagree: Agree {Agree=5, Disagree=0,
Neither Agree Or Disagree=0}
|   IMG5 = Neither Agree Or Disagree
|   |   SQL5 = Agree
|   |   |   CLT4 = Agree
```

```
|   |   |   |   FNC2 = Agree
|   |   |   |   |   SQL3 = Agree: Agree {Agree=4, Disagree=0, Neither Agree
Or Disagree=3}
|   |   |   |   |   SQL3 = Neither Agree Or Disagree: Neither Agree Or
Disagree {Agree=0, Disagree=0, Neither Agree Or Disagree=4}
|   |   |   |   FNC2 = Neither Agree Or Disagree: Neither Agree Or Disagree
{Agree=0, Disagree=0, Neither Agree Or Disagree=1}
|   |   |   CLT4 = Disagree: Agree {Agree=4, Disagree=0, Neither Agree Or
Disagree=0}
|   |   SQL5 = Neither Agree Or Disagree: Neither Agree Or Disagree {Agree=0,
Disagree=0, Neither Agree Or Disagree=12}
```



Appendix Z: Combined – Production Model [LTY1]

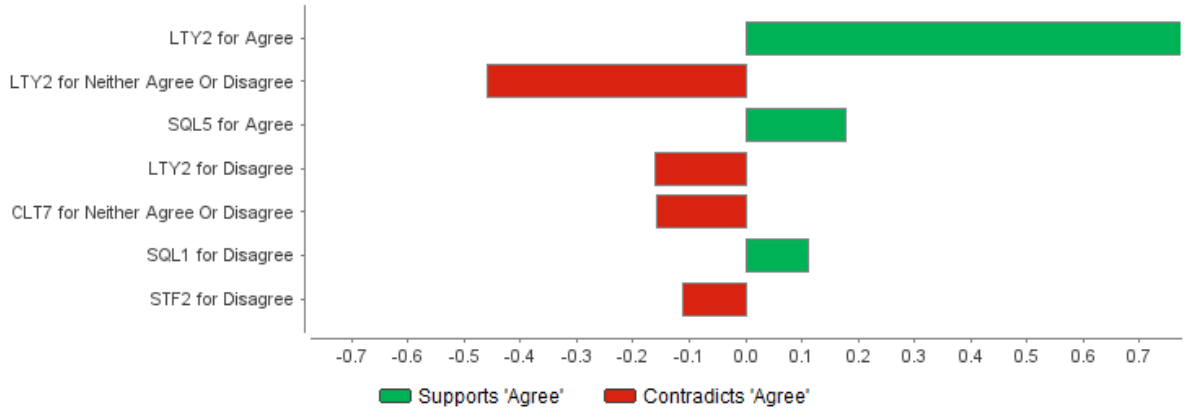
Fast Large Margin - Production Model

Binary Models

- Neither Agree Or Disagree vs. all other
- Disagree vs. all other
- Agree vs. all other

```
- 0.202 * Occupation level for Agree
- 0.060 * Occupation level for Disagree
+ 0.227 * Occupation level for Neither Agree Or Disagree
+ 0.054 * Experience using mobile telecom for Agree
- 0.188 * Experience using mobile telecom for Disagree
+ 0.099 * Experience using mobile telecom for Neither Agree Or Disagree
+ 0.014 * Gender for Agree
- 0.034 * Gender for Disagree
- 0.015 * Gender for Neither Agree Or Disagree
+ 0.044 * IMG1 for Agree
- 0.118 * IMG1 for Disagree
+ 0.039 * IMG1 for Neither Agree Or Disagree
- 0.057 * IMG2 for Agree
- 0.020 * IMG2 for Disagree
+ 0.042 * IMG2 for Neither Agree Or Disagree
- 0.131 * IMG5 for Agree
- 0.074 * IMG5 for Disagree
+ 0.169 * IMG5 for Neither Agree Or Disagree
+ 0.006 * CLT9 for Agree
```

Important Factors for Agree



Appendix AA: Combined – Production Model [LTY2]

Support Vector Machine - Production Model

Kernel Model

```
Total number of Support Vectors: 339
Bias (offset): 0.113

Feature weight calculation only possible for two class learning problems.
Please use the operator SVMWeighting instead.

number of classes: 3
number of support vectors for class Agree: 128
number of support vectors for class Neither Agree Or Disagree: 140
number of support vectors for class Disagree: 71
```

Important Factors for Agree