CHAPTER 3: EMPIRICAL INVESTIGATION – THE MOBILE PHONE OPPORTUNITY AT THE BOP

It is very clear that the private sector has an important and constructive role to play in addressing the needs of the poor

John Elkins

3.1 INTRODUCTION

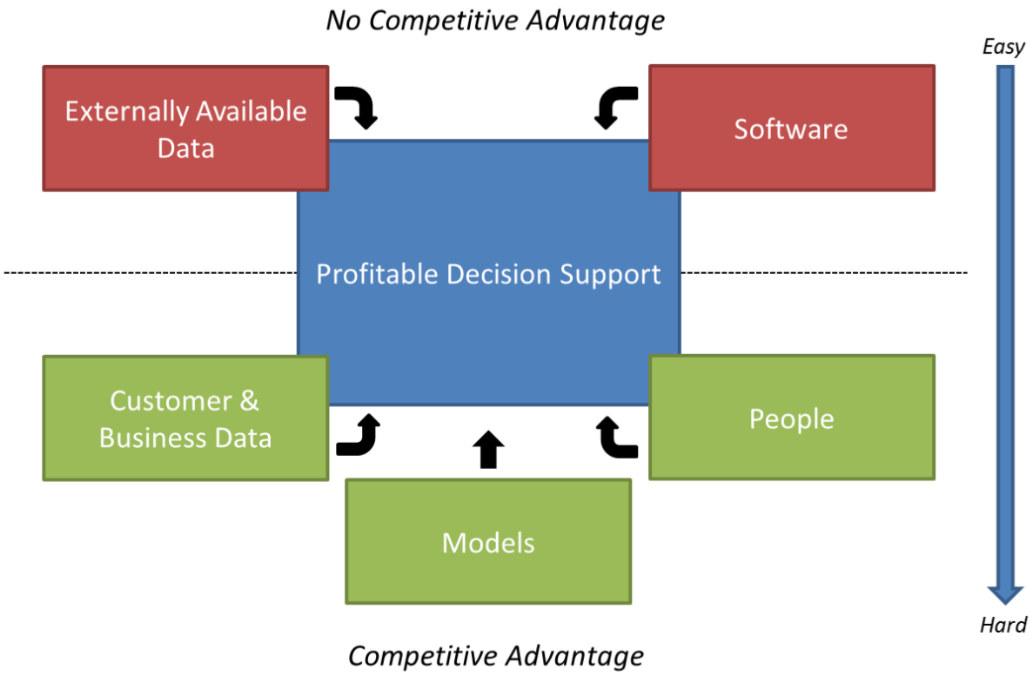
This chapter takes a tiered approach whereby two tiers or levels of research and market quantification are used to reach the stated objectives of the research. It ultimately builds on a systematic approach whereby the different aspects to be considered as discussed in chapter 2 are investigated.

3.2 GIS IN RETAIL FORECASTING

A Geographic Information System (GIS) is an enabling platform of hardware and software to allow for the management, analysing and displaying of data in geographical terms, thus, adding a spatial perspective to data. This platform allows the user to interpret, question, understand and visualise data in different ways to reveal patterns, relationships and trends (Elwood & Cope, 2009:2). The ESRI website (www.esri.com) offers some further insight by referring to the geographic approach constituting five steps. This approach will be followed later in section 3.5.

"The quick increasement of competition conditions has led the companies to be one step ahead of their rivals and act more meticulously in retail location assessment" (Karadeniz, 2009:89) Thompson and Walker (2005) highlighted the idea that in order to achieve a competitive advantage in retail network planning through geographical analysis, certain datasets or at least variables thereof need to be considered. This includes boundary, census, propensity, contextual and retail data. Retail data can be broken down into customer- and competitor data. All of these will be discussed in detail and its application in the empirical investigation in section 3.4.1. Evident from figure 21, competitive advantage through geographical analysis only comes after applying models and insight to data. After all input variables have been considered whilst turning "data into market forecasts" can a competitive advantage be obtained (Thompson & Walker, 2005:252).

Figure 21: Inputs to secure competitive advantage through geographical analysis



(Source: Thompson & Walker, 2005:252)

"To achieve a competitive edge, telecommunication companies such as Reliance Infocom Limited based in Mumbai, India, have embraced GIS as a technology that will enable them to survive, compete, and win market share" (Mishra, 2009:52). This study incorporates external data, software and models. Although the researcher's input can be seen as expertise from 'people' it is limited given that the execution of the strategy is required by all people in different positions. The application of business data can further aid in increasing the accuracy of the model developed as part of this study. However, this did not form part of the study, given the difficulty in acquiring customer and business data for usage in research.

3.3 TIERS OF ANALYSIS

Three levels or tiers can be utilised to identify suitable areas for investment for telecom companies whilst targeting the BOP. These tiers can be seen as a stepwise approach and summarised as:

- Tier 1: High-level analysis based municipal areas;
- Tier 2: Area or shopping-centre specific;
- Tier 3: Micro-site analysis.

Two of these three tiers will be utilised in quantifying the market and ultimate analysis. The first tier's focus is the entire universe encompassed by the South African boundary. This tier makes use of municipal boundaries in determining municipal areas offering the greatest opportunity for a telecom retail investment. This is also subsequently the primary focus of this research. The case study on Moruleng Mall forms part of the second tier of analysis whereby it aims to substantiate the methodology applied in tier 1. The main difference between the two levels is that tier 2 focuses on the trade area specific to the centre in question as oppose to an entire municipal area. The third tier not applied in this research focuses on micro-site location within the centre or retail node. In order to utilise the last tier of analysis requires a site visit which falls outside the scope of this research. The following section focuses on the methodology applied in order to quantify the market for telecom retail stores.

3.4 RESEARCH METHODOLOGY

At this stage it is important to clarify some terms used throughout the rest of this research. These terms focus on retail; however, given their general description requires clarity to avoid confusion between retail and cellular application. Firstly, unless otherwise stated, “coverage” refers to the coverage of retail stores offering a specific product and not the coverage of a mobile service operator's ability to offer signal in specific areas. Secondly, “network” refers to the store network of a retailer which allows them the ability to cater to potential customers in specific areas. Combining these two terms – “network coverage” – would ultimately refer to the retail store network of a mobile service provider's formal channel to cater to customers through formalised retail stores. Lastly, “penetration” refers to the number of customers as a percentage of the total population of the area in question (province, municipality, region), similar to market share based on number of customers. With the above in mind, “network expansion” would then refer to increasing the retail footprint through adding additional stores to the network.

The methodology applied is broken down into different sub-sections, firstly to discuss the data and software requirements. This is followed by a discussion on the theory relating to retail forecasting. Finally in section 3.5, the methodology and theory are applied in an attempt to answer the primary research question through quantifying the South African opportunity.

3.4.1 The utilisation of various datasets

Reworking of data is instrumental in this research given the quantitative nature thereof. Important to note is that the data are not only one-dimensional but are attributed to a spatial layer. This allows for the geographical aspect to aid in generating new variables otherwise not possible such as the distance from population to retail store locations. All of these data are used as inputs to a GIS whereby data are reworked which can then be used in the ultimate model output. The GIS (specifically MapInfo used as the GIS software) aids in establishing additional geographic variables during the reworking of the data. The next sub-sections discuss the different types of data.

3.4.1.1 Boundary data

Boundary data encompass the different geographic levels of interest. It is also this level that then determines the granularity of the data used as input into the modelling process. In GIS terms, each of the levels is indicated by a polygon. The polygon is a delineated area containing relevant data for the area in question. This data within the census are broken down into 7 levels. The different levels from highest to lowest level (with number of areas) are:

- National (1)
- Province (9)

- District Council (52)
- Municipality (232)
- Main Place (12,299)
- Sub Place (19,776)
- Small Area Layer (84,907)

Main place reflects the main urban node in the area such as Potchefstroom. The next level is sub-place which effectively indicates suburban areas such as Ikageng. This study will make use of the Small Area Layer (SAL) which is a lower level of sub-place whereby smaller areas are delineated based on physical geography such as rivers and roads. This allows for the lowest level of analysis while increasing the accuracy of calculations as all calculations are done on each specific area or polygon. All calculations referred to in the research are done on these 84,907 areas. Subsequently this also allows for an increased view and distribution of the BOP. The level of reporting will however be reflected at municipal level to ease the understanding and usage of the dashboard (refer to 3.5.3.2). The volume of the polygons in the SAL can create confusion in the selection criteria especially because this is not named but rather numbered. At the same time, the municipal layer allows for more manageable selection criteria and holistic view of a greater area.

3.4.1.2 Demographic data

A study by Byrom, Bennison, Hernandez and Hooper (2000), focused on the use of geographical information in retail location planning in the United Kingdom (UK), found that 70% of respondents made use of census data. This supports the notion of this research to use the recent 2011 Census data from Statistics South Africa (SSA) as the primary underpinning demographic dataset. Variables offered by census and subsequently used in this research include:

- Demographic Breakdown
    - Population count
    - Household count and size
    - Age
    - Race

    - Language
- Socio-Economic Breakdown
    - Dwelling Type
    - Dwelling Tenure
    - Education
    - Income
    - Household goods

This research then also makes use of household income in order to identify the South African BOP. As alluded earlier (see section 2.2.4), households earning less than R38,200 per annum are regarded as the BOP for the purposes of this study.

3.4.1.3 Contextual data

Contextual data contextualise the area of interest. In geographical terms, it gives orientation to a map through adding a spatial perspective. Data that can be classified as contextual data include roads, railways, suburbs and geographical occurrences among other. This data is of limited value in terms of analysis however can be reworked to add additional insights. Adding drive time through road networks is one such example (Thompson & Walker, 2005:253).

Bing Maps is an online map server developed by Microsoft, similar to Google Maps / Earth whereby aerial photography and road networks are streamed. This online map server will be utilised as contextual data for orientation purposes. Road networks will allow for the addition of drive time analysis within the case study. This aids in increasing the accuracy of travel patterns through moving away from a distance to time related variable.

3.4.1.4 Retail data

Data pertaining to the retailer aspect of this research refer to store locations. Thompson and Walker (2005:254) refer to two types of retail – competitor locations and business data. Given that no business data could be attained for this research forces the emphasis on locational factors, ultimately, focusing on retail store coverage and not company market penetration. Should business data be available, one could substitute or complement coverage with penetration as an analysis variable.

Various sources were considered when capturing store locations from freely available sources. This included telecommunication websites as well as other directories such as yellow pages and privately held websites (this process will be explained in more detail later in this chapter). All telecom retailers were included in this study to allow the user a competitor analysis function. Important to note at this stage is the naming convention for Telkom’s cellular offering which was launched as 8ta but is in the process of changing to Telkom Mobile. At the time of this study it was, however, still known as 8ta and therefore all naming conventions remain as is although 8ta can also be referred to as Telkom Mobile. This also contributes to the fact the dashboard can be used for any telecom retailer enhancing the usage and functionality of the dashboard.

Another consideration in applying retail locational data is consumer related benchmarking pertaining to retail nodes or shopping centres, thus, how and where people transact in a certain geographical market. The limited application of international retail models on the South African market was cited as motivation in developing a model by Prinsloo (2010). This research conducted by Prinsloo (2010) was an extension of the initial retail hierarchical model developed by Kahn (1988) and offers a benchmark specific to the South African market. This hierarchical model is important in the inclusion of this study given the focus on consumer mobility. Mobility would then influence the support area and ultimate area in retail coverage of shopping centres. This methodology and model was applied to telecom retail coverage. The complete classification and hierarchy of retail facilities in South Africa is included in Annexure A.

The hierarchy of retail nodes indicates that the support area around different types of centres range from 1km for a convenience centre (smaller retail offering focused on basic goods) up to 10km for a super-regional centre (larger retail node with a wide variety of retail categories). Prinsloo and Prinsloo (2004: 213) indicate that travel time or distance to retail nodes can be used in determining trade areas. A further distinguishing factor between primary, secondary and tertiary trade areas indicate that the primary trade area is determined by 60-70% of the originating customer support for a specific centre. The wider retail offering in a super-regional centre compared to a convenience centre explains the difference in size of trade areas. Thus, the larger the centre the greater the number of stores which can offer a wider variety of retail stores and product. This wider offering will attract customers from a wider support or trade area. Prinsloo (2010:72) highlights that central business district (CBD) areas can experience support of up to a 50km radius whilst rural retail developments can experience support of up to a 80km radius. These are vast trade areas which can be attributed to the disperse population distribution in rural areas such as experienced in the Northern Cape. This scattered population distribution drives the limited retail nodes in certain areas characterised by low density population distribution.

Shopping centre data from the SACSC are also utilised to establish a benchmark across different segments and utilise as another retailer input. Gaddy (2013:23) notes that South African shopping centres are overtrading, reporting numbers of up to 25 people per m^2 of shopping centre space (gross leasing area) per month. This is as a result of lower shopping centre supply in South Africa with $0.4m^2$ shopping centre gross leasing area (GLA) per person which is much lower than the US benchmarks of $2m^2$ GLA per person. Prinsloo, as quoted in Gaddy (2013:23) highlights that a lot of retailers are still situated in CBD and rural areas which could skew this result.

3.4.1.5 Propensity data

Propensity data refer to the tendency of people to transact which can be seen as an input factor to population figures in order to quantify the market or ultimate opportunity. Thus, propensity data take the form of spending power and levels of patronage (Thompson & Walker, 2005:253). In this research propensity data take the form of levels of mobile phone adoption as well as mobile phone expenditure (in other words, the number of simcards per household income group as well as ASPU). By applying these input factors to the demographics, the total market is quantified on the same level as the boundary data utilised. This allows quantifying the demand from a demographic perspective.

3.4.2 Software Utilisation

Numerous software packages are available to conduct retail analysis on a spatial platform. The more prominent programs are built on GIS software such as packages from Pitney Bowes (e.g. Winsite, Anysite and SiteMarker) and ESRI's Business Analyst. LOCUS is another prominent software package worth mentioning. Some benefits of utilising geographical analysis are evident in research conducted by Thompson and Walter (2005:256). These include insight into markets that can support strategic planning, decreasing the associated business risks pertaining to retail site investment. The time spent on poor sites can also be limited through a macro view (quick view) or tier 1 analysis which can drive focus on higher potential areas. This also refers to the objective of building a dashboard (tier 1) for strategic planning as this enables the user a quick reference point of opportunity in each of the areas specified.

Microsoft Excel offers an easy and cost-effective platform to distribute and rework data. Some difficulties were experienced with processing power as a result of the expansive datasets which may have been better accommodated within Microsoft SQL. This research furthermore made use of Pitney Bowes MapInfo as base software with additional add-ons and tools such as SiteMarker. The latter was specifically utilised in the case study of Moruleng in the Pilanesberg region, situated North of Sun City.

3.4.3 Forecasting Models

Rogers (2003:24) asserts that "…from the 1920s onwards, the United States was the birthplace of sophisticated retail location analysis." Reference is also made to the pioneering efforts of researchers to develop Reilly's law of retail gravitation, the analogue method and the Huff model to support this statement (Rogers, 2003). Also important to note from this is the extensive usage of multiple regression in analysis by retailers. Numerous retail location and turnover forecasting models exist such as the analogue method, regression modelling and gravity models. The focus of this study will however be on arguably the more prominent models and techniques as outlined below. The application of different models will be assessed in the next sections and applied as part of section 3.5 where it can add value to the ultimate model developed in this research.

Yrigoyen and Otero (1998:17) assessed numerous methods of retail analysis in Spain. In their research they found that traditional gravity models in retail and trade area analysis are the best model opposed to a list assessed. Refer to Annexure B for a theoretical breakdown of the models assessed. These models can be grouped by the underpinning technique or principals used in store network analysis as listed by Wood and Tasker (2007:141) in figure 22 below.

Figure 22: Principals used in the main forecasting models

Technique	Details	Technological and data input
Experience	Rule of thumb' procedures often employed 'on site' where the benefits of experience, observation and intuition drive decision-making.	Low
Checklist	Procedure to systematically evaluate the value of (and between) site(s) on the basis of a number of established variables.	↑
Ratio	Assumes that if a retailer has a given share of competing floor space in an area it will achieve a proportionate share of total available sales.	
Analogues	Existing store (or stores) similar to the site are compared to it to tailor turnover expectations.	
Multiple Regression	Attempts to define a correlation between store sales and variables within the catchment that influences performance.	
Geographic Information Systems (GIS)	Spatial representation of geodemographic and retail data that is based on digitised cartography and draws on relational databases.	
Spatial Interaction Modelling	Derived from Newtonian laws of physics based on the relationship between store attractiveness and distance from consumers. May operate 'within' a GIS.	↓
Neural Networks	Computer-based models explicitly represent the neural and synapthic activity of the biological brain.	High

(Source: Wood & Tasker, 2007:141)

Three methods are now discussed and this forms part of potential models that can be used in retail forecasting. These include analogues, multiple regression and gravity models. The underlying methodologies, strengths and weaknesses of each of these models are listed in Annexure C.

3.4.3.1 Analogues

Analogues refer to the comparison of proposed sites to that of the existing retail network. Thus, sales forecasts are based on the performance of current stores in similar locations and/or markets (Thompson & Walker, 2005:253).
For the purpose of this research the analogue method is not used as the aim is to ascertain some reasoning behind telecommunication companies not catering towards the BOP through the formal retail channels. There would subsequently in theory not be any existing stores to be compared with.

3.4.3.2 Multiple regression

Thompson and Walker (2005:254) identify multiple regression as one statistical technique utilised in retail forecasting. This technique allows for the prediction of the unknown (such as potential store turnover) called the dependent variable. From the name, the dependent variable is subject to a set of independent variables which can be used to determine the dependent variable, in other words, assessing the correlation between the different variables (Berenson *et al.*, 2012:630).

Regression models are popular in retail forecasting given its lower cost and ease of use permitting data availability. While this model may be easier and cheaper to implement, it comes with its weaknesses. Regression analysis does not offer insight into the impact that a new store may have on the existing network. Historical data could also be skewed as poor sites may have closed which only leaves input variables from viable sites currently in operation (Thompson & Walker, 2005:256).

Considering that this research focuses on the BOP, it can be deduced that income would be similar for the entire population in the BOP and thus not applicable in this analysis. Multiple regression was, however, used in order to quantify the probability of mobile phone adoption by households. As stated in Chapter 2, Chipp *et al.* (2012) found that the BOP could be identified through the ownership of household goods. This underpinned the thinking to determine whether a positive correlation exist between household goods and mobile phone usage which could be used in determining what the adoption rate would be of households not owning a mobile phone but other household goods. Subsequently, a multiple regression was conducted with mobile phone ownership as the dependent variable. A stepwise approach to identifying independent variables found that all household goods have an acceptable level of significance (p-value of less than 0.05) which allows for all household goods to be included in the regression model (refer to 3.5.2.1).

3.4.3.3 Gravity models

Gravity models are based on the balance between supply and demand influenced by distance. Thus, the probability of a potential customer (demand) frequenting a specific shopping centre based on the attractiveness (supply) thereof. This is firstly based on the retail offering and variation thereof within a specific centre or retail node. Then, what distance a person would be willing to travel to visit the centre in question considering the other retail offering present in the area. Two principles (see figure 21) are applied in gravity modelling. These include GIS and spatial interaction modelling.

Numerous theories exist which could be used to explain retail patronage through a type of gravity model such as Christaller's central place theory, Hotelling's law and Reilly's law of retail gravitation among others (Prinsloo & Prinsloo, 2004:214). Almost all gravity models are built on the underlying principle of the Huff model which is an advance in retail gravity models. The Huff model dictates that the probability of a person transacting at a specific store becomes greater as the size of the centre or retail offering increases whilst travel time to the retail offer decreases. This forecasting model is applied in the case study of Moruleng Mall in section 3.6 of this chapter.

It should be noted that Wood and Tasker (2007:146) indicate that limitations do exist in gravity models. The main consideration for these limitations is the function of the retail store. If it has a convenience or transient focus, a gravity model will be limited in determining the trade area given that people will transact at a point of sale removed from their residing area. Arguably the best example is the filling station forecourt or fast food drive through. People transact at this point as it is convenient in their travel pattern. Conversely, per the gravity model it will have a very limited trade area given the size of the forecourt which influences its ultimate level attraction. Although this may be valid in the sale of mobile phone airtime or even prepaid simcards when considering telecom retail, in this application the limitation is of less significance as the telecom retail is seen as a specialised destination point of sale.

3.4.4 Summary

Five types of data are used in this research. These can be broken down into demand, supply and mapping data.

- Demographic and propensity data are used to determine the ultimate demand in a specified area.
- Existing retailer data function as the supply data to indicate current retailer supply in the specified area.
- Contextual and boundary data are used as mapping data.

The first part of mapping data is used purely for orientation purposes whilst the boundary data fulfil a function in the calculation portion of the research. The importance of this will be explained while addressing the methodology section.

Numerous software packages exist to aid in store location analysis. The two main software packages used in this research are Pitney Bowes MapInfo and Microsoft Excel. The interoperability of these programmes allows for ease in analysis in either programme that could conduct the specific function required with ease.

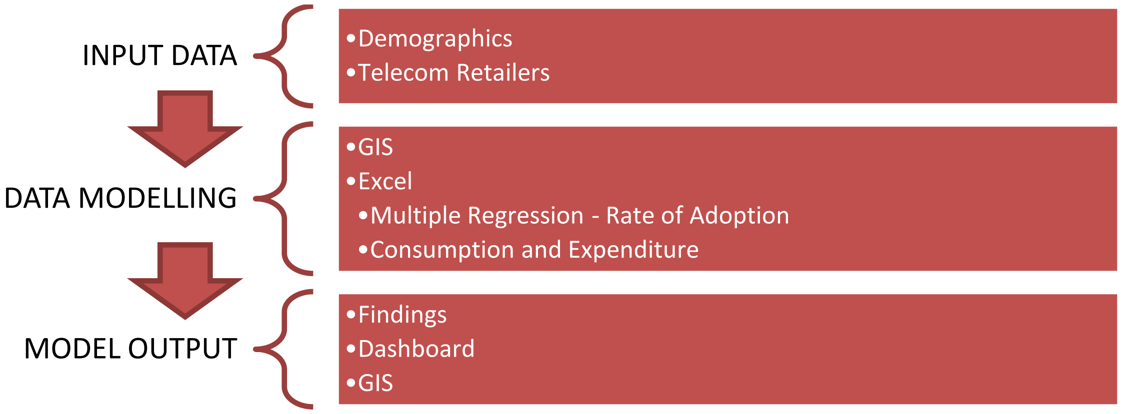
From the above it is evident that the models utilised in this research are among the main and more complex models available for use as tools in site evaluations. The principles used in this research include multiple regression, GIS and spatial interaction modelling. All these methods are highly technology and data dependent. The combination of GIS and spatial interaction models, or rather platforms, used in the case study is firmly based on the Huff model.

The following section focuses on applying the methodology to the data in an effort to quantify the South African opportunity.

3.5 QUANTIFYING THE SA OPPORTUNITY

In essence the methodology as explained in the above is now applied. The systematic approach followed can be summarised in three steps as set out below. These all contribute to the development of the ultimate result (outcome) represented in the dashboard.

Table 5: Methodology Overview



(Source: Own compilation)

3.5.1 Input data

As highlighted earlier, demographics and telecom retailers form the input data to the model. A third input, proximity, was calculated within the MapInfo from the two underpinning datasets – Demographics and Telecom retailers.

The variables utilised from the demographic dataset are set out in section 3.4.1.2. The usage of demographic input variables such as household income and ownership of goods within households requires clarity for the purpose of the modelling discussion. Households are broken down into their respective income groups within the census data. This allows for the segmentation of the market from an income perspective. Industry benchmarks (which are dealt with later – see section 3.5.2.2) can then be applied to determine the first part of the calculation in an effort to determine the mobile phone market. The second part of the calculation deals with the rate of adoption discussed in chapter 2 as part of technology adoption modelling. Technology adoption modelling is represented in this research as a multiple regression model based on the ownership of household goods. The variables used in, as well as the regression model itself will be elaborated on in the following section. A number of additional demographic variables are also included as part of the output in an effort to give insight into the potential customer.

As mentioned, a third input was determined as a result of reworking the two existing datasets to establish a proximity parameter between existing telecom retailers and the households or population encompassed within the demographic data. This additional input was calculated within the GIS program and will be discussed in the following section.

3.5.2 Data Modelling

All modelling of existing data was conducted within either MapInfo or Excel. This allows for additional variables to be determined such as proximity from retail nodes (shopping centres) to the population. This also allows for the application of retail locational modelling theories incorporating demographics and retail variables explained in section 3.6. The following sub-sections focus on the application of input data as part of the data modelling process in order to derive results.

3.5.2.1 Multiple regression to identify the rate of adoption

A multiple regression model was conducted between households that own a mobile phone (dependent variable) and other household goods (independent variables) in an effort to determine the rate of (technology) adoption which can be applied to households without a mobile phone. Considering the findings of Chip *et al.* (2012), all household goods were considered for inclusion in the multiple regression modelling.

In order to include all variables, statistical significance testing is required. This refers to hypothesis testing to validate the inclusion of respective variables. In this research, the p-value was utilised whilst a p-value of lower than 1% (5% is more generally used) support the inclusion of the variable (Berenson *et al.*, 2012:590). The adjusted R^2 indicates the level at which the variation in the dependable variable can be explained by the variation in the independent variables considering the number thereof and sample size (Berenson *et al.*, 2012:585). In this research, the entire population was used by including all data from the SAL geographic level.

The extremely low p-value in all variables (0 in some cases) indicates that all is significant (p-value < 1%) and thus valid to include all other ownership of household goods. The adjusted R^2 indicates that 87% of the ownership of a mobile phone can be explained by the ownership of other household goods.

Figure 23: Multiple Regression Output on household goods

Regression Statistics	
Multiple R	0.933871997
R Square	0.872116906
Adjusted R Square	0.87210034
Standard Error	34.11603129
Observations	84907

ANOVA

	df	*SS*	*MS*	*F*
Regression	11	673846056.4	61258732.4	52632.13625
Residual	84895	98809595.38	1163.903591	
Total	84906	772655651.8		

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	15.40037044	0.240578634	64.0138742	0
Washing Machine	-0.195736568	0.005637532	-34.72025697	2.7228E-262
Vacuum	-0.314369022	0.009028891	-34.81811973	9.4804E-264
Stove	0.352311723	0.004587563	76.7971341	0
Refrigerator	-0.663132899	0.007108993	-93.28084759	0
Television	0.592633728	0.011062012	53.5737731	0
DVD	-0.127534292	0.009303073	-13.70883523	9.98366E-43
Satelite	-0.218197145	0.007114776	-30.66816743	2.0199E-205
Radio	0.919165063	0.00435199	211.205696	0
Computer	0.443002338	0.00822524	53.85889416	0
Landline	-0.152503564	0.006496792	-23.47367221	1.8518E-121
Motor	0.322608401	0.010108645	31.91410812	3.5449E-222

(Source: Adapted from Statistics South Africa, 2011)

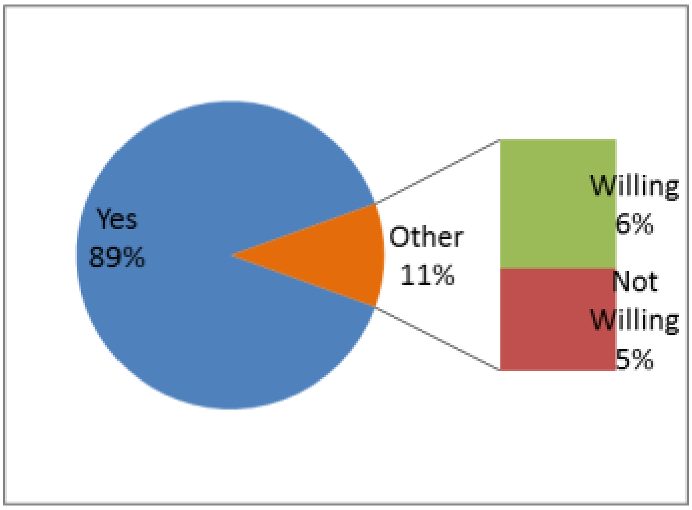
Data for households not owning a mobile phone were selected per SAL. The result of the regression analysis was subsequently applied to these data per SAL in order to quantify the number of households that will adopt mobile phones. A negative correlation was found between mobile phone ownership and washing machine, vacuum, refrigerator, DVD player, satellite TV and a landline phone. On the other hand, a positive correlation was found between the ownership of a mobile phone and households that owned a stove, TV, radio, computer and motorcar. Some conclusions that can be drawn from this are that ownership of 'higher priority' luxury goods such as a car (motor) and computer would influence the rate of adoption positively. A possible reason for ‘radio’ achieving such a high coefficient is that almost all households have one given the availability and affordability thereof. Other independent variables such as owning a satellite or vacuum cleaner have a lower priority. The correlation of this multiple regression model is represented by the following equation and subsequently applied to the data of household goods ownership in households not owning a mobile phone.

Regression equation:

Y = Intercept – 0.169(Washing Machine) – 0.314(Vacuum) + 0.352(Stove) – 0.663(Refrigerator) + 0.593 (TV) – 0.128 (DVD) – 0.212 (Satelite) + 0.919 (Radio) + 0.449(Computer) – 0.153 (Landline) + 0.323 (Motor)

The census data reflected that 89% of all households in South Africa have a mobile phone with 11% not having a mobile phone within their respective household. By applying the above equation, it was found that 6% would be willing to adopt mobile phones given the ownership of other household goods. The balance (5%) would not be willing to adopt given their lack of other household goods. This market breakdown is displayed in figure 24.

Figure 24: Households with a mobile phone and willingness to adopt



(Source: Own compilation)

The following section is attributed to mobile phone simcard consumption and expenditure. These benchmarks also form a vital input in quantifying the market.

3.5.2.2 Mobile phone consumption and expenditure

Given that the number of mobile phones per household (consumption rate) and mobile phone expenditure were lacking in the census data, industry benchmarked data had to be applied. All Media and Product Survey (AMPS) data from Eighty20, a consumer and market research consultancy, were subsequently utilised. AMPS is updated on an annual basis with the dataset forming part of the offering from the South African Audience Research Foundation (SAARF). Expenditure and number of mobile phones (simcards) per household are the two important variables in this dataset. This was broken down per income group which ultimately allowed for quantifying the total mobile phone demand.

Mobile phone related data were compiled from 25,108 households in South Africa. This sample was broken down into income groups which allowed for it to be applied to the Census 2011 dataset primarily utilised in this research (refer to Annexure D for a view of the sample data from Eighty20). Information from this dataset, however, required to be reworked in order to align with the data categories of the 2011 Census. Table 6 below gives a summary of this. As indicated in section 2.5, different expenditure and consumption results were evident from different sources. The decision was made to make use of the data from Eighty20 as this was the only dataset where actual figures were reported. This limited the required assumptions which would increase the accuracy of the result. Noticeably, the lowest income level (R1 – R4800) has a higher expenditure to the income group ranging from R4801 – R9600 per annum. It was decided to keep with this discrepancy given that the source made use of actual data. However, further research may be required to validate this.

Table 6: Household Mobile Phone Consumption

Household Income Group	Monthly ASPU per household	Number of Phones per household
No income	1.00	1.00
R 1 - R 4800	44.42	1.42
R 4801 - R 9600	37.93	1.41
R 9601 - R 19 600	45.08	1.61
R 19 601 - R 38 200	55.07	1.88
R 38 201 - R 76 400	77.43	2.31
R 76 401 - R 153 800	118.06	2.69
R 153 801 - R 307 600	185.94	2.99
R 307 601 - R 614 400	303.95	3.31
R 614 001 - R 1 228 800	303.95	3.31
R 1 228 801 - R 2 457 600	303.95	3.31
R 2 457 601 or more	303.95	3.31
Unspecified	44.42	1.42

(Source: Adapted from Eighty20, 2012)

Data for ‘No Income’ were replaced by “1” as not to disregard this potential market as this segment still offers opportunity, however limited it may be. Similarly, data from the lowest income group were taken to populate ‘Unspecified’. The reasoning for this is that the ‘Unspecified’ income group (last row in table 6) is anticipated to have an income, however just unknown and as such the lowest level of consumption was applied to this group. Lastly, the highest income group in the AMPS dataset is households earning more than R50,000 per month. For this reason income groups in the Census breakdown from an annual income of R307,601 have the same spend and number of phones.

3.5.2.3 Retailers and Shopping Centres

A lack of freely available datasets in South Africa has a limiting effect on research possibilities. Retailer datasets are available from a host of GIS data resellers; however, the accuracy is questioned in this as categories may be outdated and unreliable. In an effort to overcome this challenge, a number of separate data sources along with websites of the respective telecom operators were visited and data relating to store locations captured. Where co-ordinates were available from the source, they were also captured. However, the majority of the sources only offered physical addresses, sometimes lacking street addresses. In order to adapt this dataset then for spatial interpretation, a process called geo-coding is required whereby physical addresses are mapped to a spatial platform which allows for the return of coordinates. This subsequently allowed for spatial analysis on the demographic data layer, already in a spatial format. In essence, a data capturing process was started to copy any relevant data from internet sources to excel format. This was then geo-coded (or mapped) based on street addresses and where street addresses was unobtainable, to suburbs. This is a timeous exercise with the accuracy of the data perhaps not fully accurate given the time delays in retailers updating their store lists. Again, this was necessitated by the lack of appropriate datasets readily available.

Data from the SACSC pertaining to shopping centres, especially GLA, were incorporated in the study to function as a benchmark for retail space. These data, however, included coordinates which then similarly allowed for incorporation into the spatial platform along with retailer and demographic data with limited effort.

With all required data ready for spatial correlation and interpretation, a process of reworking the data in MapInfo (GIS) was started.

3.5.2.4 Reworking of input data

In linking the retail data with the demographics in this research, the proximity between the two datasets was determined. Firstly, a spider graph was run between each SAL containing the demographic data and every variable in the retail data. The latter included shopping centres with a GLA greater than 10,000m² and all telecom retail stores. Applying these proximity results to the weighting in each SAL (represented by population figures) allowed for the average distance to stores to be determined. This offered a proximity result (km) to telecom retail benchmarked against proximity to shopping centres. Annexure E gives a visual of the GIS interface utilised in determining the proximity by means of a spider graph.

Referring to the discussion earlier on shopping centre benchmarked support areas (in section 3.4.1.4) by Prinsloo (2010), it was decided that a 10km radius or buffer would be used to determine telecom retail coverage. The decision on this value was driven by the specialist nature of telecom retail stores in comparison with the offering in super-regional centres. Although certain CBD areas of town centres experience support from much further afield, caution had to be exercised so as not to attribute a too big buffer area to telecom retail stores which may skew results negatively. This would ultimately limit the opportunity calculated. Conversely, a too small buffer region will have the adverse effect determining too a great opportunity. The value of the buffer region will be further explored as part of the case study.

A 10km buffer (radius) was delineated around each of the retail stores and shopping centres. A visual representation of the radii is included in Annexure F. From here, all SAL were updated by several columns, one for each retail layer – i.e. Shopping centre, Vodacom, MTN. These columns were updated with either a value of “1” or “0”. A value of 1 indicates that the SAL is within a respective retailer’s 10km radius and a “0”, not. This is the underpinning method for allowing the selection criteria by telecom retailer.

3.5.3 Model Outputs

This high level summary of outputs as a result of the methodology applied can be seen as a first step in determining areas of opportunity. The result of this first tier of analysis is encompassed in the set of outputs as per the following section giving a provincial overview on results.

3.5.3.1 Results on the model outputs

This section highlights key results regarding the total size of the mobile phone market which aims to link results with that found in literature in order to evaluate results.

- Representation and proximity

Referring to table 7, 1847 telecommunication retail stores were found to be present in the South African market catering to the demand of consumers. The majority of these stores form part of the two largest mobile operators in the country i.e. Vodacom with 651 (35%) and MTN with 498 (27%). Vodacom outnumber all the other mobile phone retailers in all the provinces. Surprisingly, Pep Cell has the third most stores at 178

(10%), more than the other two mobile operators, Cell C with 113 (6%) and 8ta with 121 (7%). Of interest is that 8ta has more stores when compared to Cell C, who has a greater market share (in total number of subscribers) than 8ta. A possible explanation for this could be 8ta leveraging off their traditionally landline business, which has a more established retail network as a result of them being in the market for a considerable length of time, even before Vodacom and MTN.

Table 7: Number of Telecom Stores by Province

Province	Vodacom	MTN	Altech Autopage	Nashua	PepCell	Cell C	8ta	Virgin Mobile
Eastern Cape	45	39	7	6	19	13	13	1
Free State	40	30	6	11	4	5	7	1
Gauteng	218	170	47	50	63	44	32	9
KwaZulu-Natal	85	70	25	24	30	20	24	2
Limpopo	45	24	7	7	21	1	7	1
Mpumalanga	46	32	4	12	14	4	5	4
North West	42	23	6	7	7	5	4	1
Northern Cape	22	12	1	6	1	2	2	-
Western Cape	108	98	18	22	19	19	27	1
National	**651**	**498**	**121**	**145**	**178**	**113**	**121**	**20**

(Source: Own compilation)

Considering only the number of stores per retailer offers a starting point but greater insights can be gained when considering the spread of these stores in relation to the population and ultimately, the potential market they wish to target. The average direct distance from each of the SAL's to the closest telecom retailer is summarised by province in table 8 below. The distance to shopping centres greater than 10,000m² GLA was also included as a benchmark to general retail. This does however not include CBD retail.

Table 8: Average direct distance (km) to a telecom retailer

Province	Shopping Centre	Vodacom	MTN	Altech Autopage	Nashua	PepCell	Cell C	8ta	Virgin Mobile
Eastern Cape	37.01	28.07	32.87	83.26	75.01	30.16	49.51	48.67	165.31
Free State	24.47	25.90	28.00	36.59	37.48	58.18	54.42	33.40	104.19
Gauteng	3.59	4.45	4.27	8.28	10.43	5.16	9.02	8.56	16.77
KwaZulu-Natal	17.63	24.66	21.97	34.43	31.74	21.93	37.91	29.50	97.94
Limpopo	22.50	23.85	26.67	76.35	42.13	27.84	97.24	45.31	96.45
Mpumalanga	16.74	18.88	19.06	48.10	30.35	32.31	53.74	41.81	65.40
North West	28.58	23.79	25.97	37.67	41.37	36.91	46.24	69.91	128.44
Northern Cape	82.91	37.35	40.38	167.79	58.86	175.55	183.67	126.07	307.29
Western Cape	14.80	6.84	5.49	18.17	18.71	47.33	21.17	14.02	73.97
National	**19.43**	**18.05**	**18.56**	**41.32**	**33.24**	**29.62**	**42.74**	**32.92**	**88.87**

(Source: Own compilation)

From table 8 it is evident that the two larger mobile operators have moved closer to the consumer with Vodacom an average direct distance of 18.05km from the potential customer and MTN, 18.56km. Both these are on average closer than the formal retail supply within shopping centres greater than 10,000m² GLA. This indicates that the retail operations of the above are not centralised in only shopping centres but also situated in other more traditional retail nodes. This is also supported and ultimately enabled through the higher number of retail stores within their network. Conversely, on the other end of the scale is Virgin Mobile followed by perhaps rather surprisingly, Cell C.

It is understandable that people in the Northern Cape would have to travel further to frequent a telecom retail store given the dispersed nature of the province while Gauteng's nucleated population benefits the most from their proximity. Gauteng is closely followed by the Western Cape, given similar population distribution across the province. Larger towns throughout the province offer smaller retail hubs supported by localised communities such as George and Worcester. A lower population in the more rural, farming areas aids in keeping the proximity factor in favour of consumers. KwaZulu-Natal is an example of this as the rural population is much higher when compared to the Western Cape although the nature of its urban fabric is similar to main metropolitan areas complemented by larger towns.

Tables 7 and 8 also show that although Vodacom has the most retail stores in their network, ±31% more than MTN, they are only ±3% closer to the total potential market. This raises the question as to whether MTN makes more of their retail stores' locational spread and are in fact more efficient in placing their stores. Thus, Vodacom requires a greater number of stores to effectively service their larger market which drives their requirement to have more stores in a single location such as a regional shopping centre. The twelve largest shopping centres in South Africa were used as a sample to indicate the number of mobile phone stores per shopping centre (see table 9). This sample indicates that there is an average of nine telecom retail stores per shopping centre (keep in mind this is only on the larger centres) with Vodacom having an average of 2.8 stores per mall compared to MTN's 1.8 stores per mall.

Table 9: Telecom retailers in the 12 largest shopping centres

Shopping Centre Name	Classification	GLA (m^2)	Number of Stores								Total
			MTN	Vodacom	Altech Autopage	Nashua	8ta	Cell C	Virgin	PepCell	
Gateway Theatre of Shopping	Super Regional Mall	154 840	2	3	1	0	1	1	0	0	**8**
Canal Walk	Super Regional Mall	147 362	2	3	1	1	1	1	1	0	**10**
Sandton Retail Node: 1. Sandton City	Super Regional Mall	144 938	1	2	1	1	0	1	1	0	**7**
The Pavilion - Westville	Super Regional Mall	119 000	2	2	1	1	2	1	1	0	**10**
Menlyn Park Shopping Centre	Super Regional Mall	118 989	2	3	1	0	1	1	1	1	**10**
Eastgate Shopping Centre - Bedfordview	Super Regional Mall	118 732	2	4	1	0	1	1	1	0	**10**
Centurion Retail Node: 1. Centurion Mall & Centurion Boulevard	Super Regional Mall	108 849	2	3	1	1	0	2	0	0	**9**
Westgate Shopping Centre	Super Regional Mall	106 270	2	4	0	0	1	1	0	2	**10**
Cresta Shopping Centre	Regional Mall	94 287	2	3	1	1	1	1	0	0	**9**
Northgate Shopping Centre	Regional Mall	90 017	2	2	1	1	0	1	0	0	**7**
Clearwater Mall	Regional Mall	90 000	2	2	1	1	1	1	1	0	**9**
Tyger Valley Centre	Regional Mall	88 893	1	3	1	0	1	2	1	0	**9**
Total			**22**	**34**	**11**	**7**	**10**	**14**	**7**	**3**	**108**

(Source: Adapted from SACSC, 2012)

Given that this study primarily focuses on the BOP, the distance to this market also had to be assessed. Evident from table 10 is that mobile phone operators' retail networks are further from the BOP when compared to the Rest of the Pyramid (ROP). In fact, it is further than the average distance across the entire market, except for Pep Cell which is almost on par at the BOP when considering the average of the total population. This is also evident in Pep Cell's target market, even though they are also closer to the ROP.

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Table 10: Comparison between proximity in different markets

Demographic	**ALL**	**BOP**	**ROP**
Shopping Centre	19.43	20.69	15.71
Vodacom	18.05	20.05	13.47
MTN	18.56	20.94	13.72
Altech Autopage	41.32	45.51	31.83
Nashua	33.24	36.39	25.92
PepCell	29.62	29.78	27.28
Cell C	42.74	46.53	34.09
8ta	32.92	36.07	26.09
Virgin Mobile	88.87	92.48	74.95

(Source: Own compilation)

- Mobile phone retail coverage

Results indicate that only two-thirds of the population is covered by formal mobile phone retail stores or within a 10km radius from a store. Almost all households are covered by retailers in Gauteng (98%) with 87% covered in the Western Cape.

As alluded to earlier, the differences in the distance to the potential market between Vodacom and MTN are similar and also reflected in table 11, below. Vodacom only covers 60% of the South African market followed by MTN's 59%.

Table 11: Telecom retailer coverage

Province	Vodacom	MTN	Altech Autopage	Nashua	PepCell	Cell C	8ta	Virgin Mobile	Any
Eastern Cape	39%	38%	16%	16%	36%	29%	27%	1%	**47%**
Free State	44%	44%	32%	37%	21%	27%	32%	16%	**49%**
Gauteng	91%	90%	71%	60%	87%	69%	68%	33%	**98%**
KwaZulu-Natal	52%	54%	45%	45%	45%	41%	46%	18%	**59%**
Limpopo	25%	21%	8%	11%	21%	4%	14%	3%	**30%**
Mpumalanga	37%	37%	13%	23%	23%	9%	15%	7%	**51%**
North West	44%	39%	24%	27%	32%	26%	20%	2%	**47%**
Northern Cape	42%	39%	17%	31%	17%	17%	23%	0%	**45%**
Western Cape	85%	85%	57%	60%	59%	71%	76%	15%	**87%**
National	**60%**	**59%**	**41%**	**40%**	**50%**	**42%**	**44%**	**16%**	**66%**

(Source: Own compilation)

Given the fact that Pep Cell is currently covering half of the total market through their existing network of 178 stores, theoretically Pep Cell would have to double their number of stores to cover the total market. This would, however, not be possible as the current half of the market covered is situated in densely populated areas with the balance estimated to be spread over the rest of the country, in other words, to cover the entire country 3,892 stores calculated as the area of SA (1.2million km^2) divided by the area covered by one store (314 km^2). This would, however, also not be optimal as retail is an integral and complex phenomenon subjected to a range of consumer preference dynamics such as retail offering consideration and required travel time.

Different retail strategies would be required by the different retail operations, each driven by their level of coverage and strategic thinking. Based on these results, Vodacom would have to take a defensive stance, opening new stores in developing malls with some emphasise placed on optimising current footprint. MTN's focus would have to be on efficient and optimal expansion. Given that they are only a few stores behind the market leader Vodacom, additional stores in the right locations could result in a growing market share. Conversely, the others, all with fewer than 200 stores, would require an aggressive expansion strategy. These retailers have shown that it is possible to cover a large portion of the market with only a number of stores however to be able to build capacity and further reach in the market, a significant number of more stores would be required.

Table 12: Household telecom retailer coverage

	All Households			Households not covered			Percentage of Households not covered		
Province	Total	BOP	ROP	Total	BOP	ROP	Total	BOP	ROP
Eastern Cape	1 683 627	912 606	771 021	884 094	542 829	341 265	53%	59%	44%
Free State	821 883	385 854	436 029	416 406	222 537	193 869	51%	58%	44%
Gauteng	3 903 393	1 411 467	2 491 926	87 300	35 046	52 254	2%	2%	2%
KwaZulu-Natal	2 535 831	1 224 822	1 311 009	1 049 697	596 091	453 606	41%	49%	35%
Limpopo	1 415 466	786 897	628 569	984 273	587 112	397 161	70%	75%	63%
Mpumalanga	1 073 814	504 807	569 007	523 320	273 510	249 810	49%	54%	44%
North West	1 060 944	497 328	563 616	563 961	291 987	271 974	53%	59%	48%
Northern Cape	301 131	124 119	177 012	166 278	76 389	89 889	55%	62%	51%
Western Cape	1 634 046	515 637	1 118 409	219 624	71 283	148 341	13%	14%	13%
National	**14 430 135**	**6 363 537**	**8 066 598**	**4 894 953**	**2 696 784**	**2 198 169**	**34%**	**42%**	**27%**

(Source: Own compilation)

The above table indicates that close to half (42%) of the BOP is not covered by telecom retail in comparison with only 27% not covered in the ROP. Limpopo has the largest percentage in the BOP not covered by telecom retail whilst KwaZulu-Natal, Eastern Cape and Limpopo offer the greatest level of opportunity to cater to this opportunity.

- Formal Shopping Centre space in relation to telecom retail

Retail demand can be quantified through the population of South Africa, housed within around 14.4million households. On the other end, retail supply is offered through 21.3million m² GLA shopping centre space. Combining these two, a supply to demand ratio can be determined represented by the number of households per 1m² shopping centre GLA. When comparing these on a provincial level (see table 13), Gauteng followed by the Western Cape offers the greatest supply to demand ratio indicated by a lower ratio households to shopping centre space. The lower this ratio, the more shopping centre space is on offer for every household. Similarly, these two provinces also represent the majority of telecom retailers. The result is that more shopping centre space is available per telecom retailer. The opposite is true in provinces offering lower levels of shopping centre space such as Limpopo and the Eastern Cape. In these, shopping centre space is still relatively high in comparison with the number of telecom retailers. The lowest GLA per retailer is evident in the Free State and the Northern Cape.

Table 13: Shopping Centre benchmarks

Province	Total SC GLA	Total Households	Total Telco Retailers	Households per 1m² GLA	GLA per Telco Retailer
Eastern Cape	1 312 000	1 683 627	143	1.28	9 175
Free State	804 704	821 883	104	1.02	7 738
Gauteng	9 444 257	3 903 393	633	0.41	14 920
KwaZulu-Natal	2 769 161	2 535 831	280	0.92	9 890
Limpopo	1 102 421	1 415 466	113	1.28	9 756
Mpumalanga	1 283 484	1 073 814	121	0.84	10 607
North West	878 758	1 060 944	95	1.21	9 250
Northern Cape	246 295	301 131	46	1.22	5 354
Western Cape	3 480 531	1 634 046	312	0.47	11 156
National	**21 321 611**	**14 430 135**	**1 847**	**0.68**	**11 544**

(Source: Own compilation)

It is interesting that provinces offering significant opportunity as per table 16 (below) also offer formalised shopping centre space (in table 13) to enable such growth. This raises the question as to why telecom retailers do not cover these areas. A complete list of opportunity by municipal area is listed in Annexure G.

- Total Market quantified

In closing this section on results, a comparison will be made between the research conducted and that of the most recently available statistics as published in Hammond *et al.* (2007) pertaining to the mobile phone industry. This will aid as the first level of validation for the methodology used. Table 14 give a national level breakdown of the total monthly market (value and volume) in the telecom market split between the BOP and the ROP.

Table 14: Total Monthly Market

Sum of Estimated Market BOP	Sum of Estimated Market ROP	Sum of Sims BOP	Sum of Sims ROP
R 563 410 124	**R 2 416 057 485**	**13 735 311**	**14 577 403**

(Source: Own compilation)

The total market (BOP and ROP) as determined by the model is estimated at R2979 million per month. The BOP contributes R563million per month through 13.7 million simcards to this total market. Thus, the BOP represents ±19% of the value (Rand value) of the total market and 49% of the total volume (simcards). The value in the BOP equates to a market of roughly USD 676 million per annum calculated as annualising R563 million and converting to USD (at a R10 to USD 1 exchange rate. The market sizing compares favourably to that of Hammond *et al.* (2007:143). Hammond *et al.* (2007) determined the South African ICT market to be USD 5412 million of which USD 745 million comes from the BOP. Thus, the BOP contributes 13.8% to the total ICT market. Although this calculation was based on 2005 purchase price parity whilst being roughly USD 70 million less in the BOP sizing, numerous reasons could be supplied for a favourable comparison:

- It should be noted that only the mobile phone market is being assessed in this research whilst being compared with ICT sector as a whole (which constitutes a much wider market, in Hammond *et al.*, 2007).
- The recent macro-economic situation worldwide further limits current expenditure in local markets.

Table 15: Total breakdown of the South African BOP market as per Hammond *et al.*

BOP expenditure by sector

$ (**Boldface** numbers are millions)	Total BOP	BOP 500	BOP 1000	BOP 1500	BOP 2000	BOP 2500	BOP 3000	Urban / rural (% of BOP)
Food	**17,358.5**	**1,265.6**	**4,036.8**	**3,891.2**	**3,245.4**	**2,705.4**	**2,214.1**	54/46
Per capita	548	205	404	606	779	944	1080	
Per household	2548	1426	2222	2684	2909	3091	3315	
Housing	**4,440.4**	**305.7**	**867.5**	**922.9**	**845.3**	**771.2**	**727.8**	66/34
Per capita	140	49	87	144	203	269	355	
Per household	652	344	477	637	758	881	1090	
Water	**543.8**	**17.0**	**85.6**	**113.5**	**122.5**	**116.5**	**88.6**	86/14
Per capita	17	3	9	18	29	41	43	
Per household	80	19	47	78	110	133	133	
Energy	**2,582.9**	**147.5**	**572.7**	**593.4**	**514.2**	**418.7**	**336.4**	61/39
Per capita	82	24	57	92	123	146	164	
Per household	379	166	315	409	461	478	504	
Household goods	**4,509.6**	**193.4**	**810.2**	**979.3**	**925.5**	**836.6**	**764.6**	56/44
Per capita	142	31	81	153	222	292	373	
Per household	662	218	446	676	830	956	1145	
Health	**576.9**	**20.8**	**91.3**	**97.7**	**108.5**	**125.2**	**133.3**	58/42
Per capita	18	3	9	15	26	44	65	
Per household	85	23	50	67	97	143	200	
Transportation	**2,267.3**	**60.9**	**300.6**	**408.5**	**509.6**	**511.0**	**476.6**	64/36
Per capita	72	10	30	64	122	178	233	
Per household	333	69	165	282	457	584	714	
ICT	**744.9**	**13.6**	**88.4**	**151.2**	**162.7**	**165.8**	**163.2**	68/32
Per capita	24	2	9	24	39	58	80	
Per household	109	15	49	104	146	189	244	
Education	**895.2**	**53.8**	**152.4**	**166.3**	**174.3**	**183.7**	**164.8**	64/36
Per capita	28	9	15	26	42	64	80	
Per household	131	61	84	115	156	210	247	
Other	**6,415.4**	**285.9**	**1,135.2**	**1,351.0**	**1,316.5**	**1,223.6**	**1,103.2**	59/41
Per capita	203	46	114	210	316	427	538	
Per household	942	322	625	932	1180	1398	1652	
Total	**40,334.9**	**2,364.3**	**8,140.7**	**8,675.1**	**7,924.5**	**7,057.8**	**6,172.5**	58/42

Household expenditure by sector

	National ($ millions)	BOP (%)
Food	37,888.4	45.8
Housing	14,359.7	30.9
Water	1,847.2	29.4
Energy	6,366.3	40.6
Household goods	12,909.6	34.9
Health	6,749.8	8.5
Transportation	16,663.5	13.6
ICT	5,412.3	13.8
Education	4,067.9	22.0
Other	29,561.1	21.7
Total	135,825.8	29.7

Sector shares of household expenditure (%)

	National	BOP
Food	27.9	43.0
Housing	10.6	11.0
Water	1.4	1.3
Energy	4.7	6.4
Household goods	9.5	11.2
Health	5.0	1.4
Transportation	12.3	5.6
ICT	4.0	1.8
Education	3.0	2.2
Other	21.8	15.9
Total	100.0	100.0

Note: All dollar amounts in 2005 PPP

(Source: Hammond *et al.*, 2007: 143)

Table 16 gives a breakdown of households (BOP vs ROP) not covered by existing telecom retail. Important to note here is the fact that although the BOP may reflect some ±R130 million per month lower (R379 million – R247 million) potential than the ROP, the number of simcards (sims) in the BOP far outweighs that of the ROP. Thus, the total number of subscribers can be considerably increased when targeting the BOP in a sustainable manner.

Table 16: Mobile market breakdown by province and part of the pyramid outside coverage

Province		Sum of Estimated Market BOP		Sum of Estimated Market ROP	Sum of Sims BOP	Sum of Sims ROP
Eastern Cape	R	48 205 711	R	48 345 796	1 140 625	361 100
Free State	R	21 349 265	R	33 536 367	494 295	252 865
Gauteng	R	3 445 390	R	12 461 227	81 699	89 354
KwaZulu-Natal	R	55 281 482	R	71 018 056	1 296 018	538 021
Limpopo	R	51 723 900	R	63 281 073	1 225 200	474 003
Mpumalanga	R	24 345 234	R	48 119 403	583 484	362 692
North West	R	25 858 361	R	48 375 200	625 548	388 149
Northern Cape	R	7 772 815	R	18 735 154	179 141	135 119
Western Cape	R	9 083 685	R	34 776 886	201 737	246 803
National	**R**	**247 065 843**	**R**	**378 649 161**	**5 827 748**	**2 848 105**

(Source: Own compilation)

The results indicate a greater opportunity in the ROP not currently covered by telecom retail. This drives the question of whether in fact it is rather not a question of urban vs. rural opportunity opposed to a BOP vs. ROP opportunity.

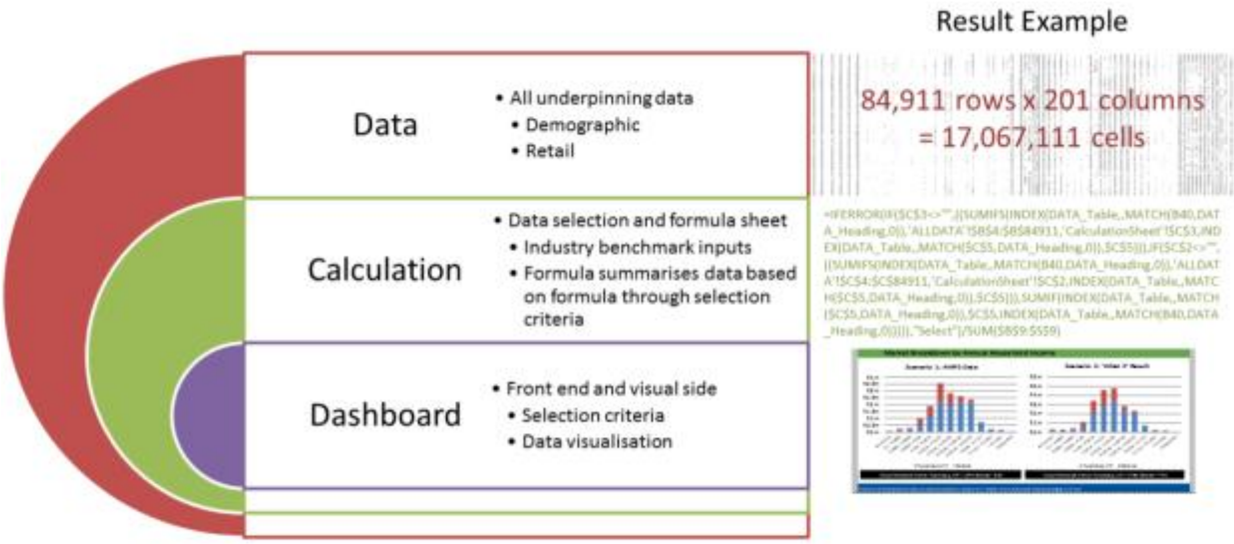
3.5.3.2 The development of a telecom dashboard

As companies moved into the information era, data and information have become more important for managers to make informed decisions. Numerous data sources exist; however, it is challenging to read and getting information from these sources is sometimes a difficult and lengthy exercise. Dashboards allow for merging different datasets through complex calculations whilst offering a single platform for easy viewing and interpretation of data (Rasmussen *et al.*, 2009:12).

Given the different and expansive datasets forming part of this study, the decision was made to develop a dashboard for easy interpretation of the data. This also allowed for viewing the BOP as part of the total market while being able to investigate and analyse different geographical areas. Each section of the dashboard will be discussed in this section of dashboard output. Noticeably the steps followed in the dashboard are similar to that of the methodology explained which includes expenditure and consumption of mobile phones per income group. This also includes the rate of adoption as determined by the regression analysis, number of telecom retail stores as well as the total shopping centre offering indicated by GLA.

The steps and underlying workings of the dashboard are illustrated in figure 25. Firstly all data were exported from the GIS and main data files to the data spreadsheet in excel. This can be seen as the input to this model as explained previously. From here, a calculation sheet was required to act as a selection mechanism to perform a lookup function between the dashboard (front-end) selection criteria and the main data sheet. Thus, selection criteria in the frontend of the dashboard feed into the calculation sheet while data are being pulled through from the data sheet based on the selection criteria. The dashboard and front-end offer a single view for the combined data based on the selection criteria.

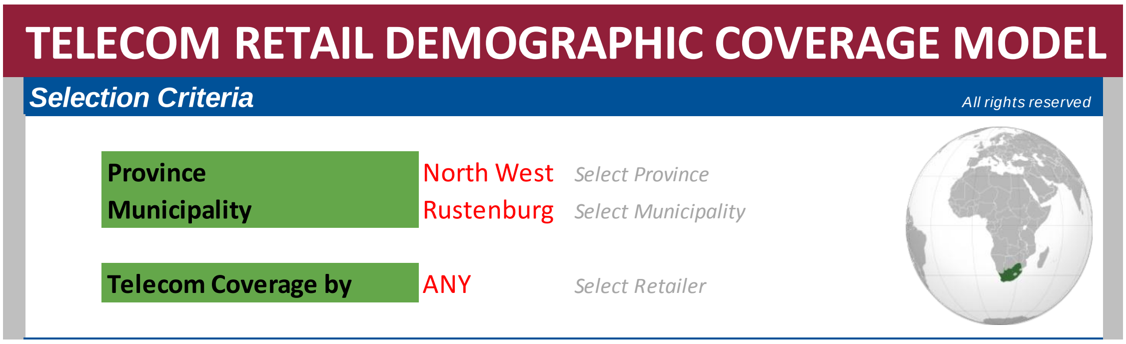
Figure 25: Dashboard compilation and workings



(Source: Own compilation)

Figures 26 to 35 are used to illustrate and discuss the layout of the dashboard front-end and interpretations thereof. The first section on page 1 of the dashboard (see figure 25) offers the user the ability to firstly select the province, for example North West, of interest. After the province has been selected, all municipalities situated in that province are selectable. In this scenario, Rustenburg was used as example municipality. The third selection pertains to the telecom operator within the relevant geographical area of interest (or municipality). Thus, section 1 on page 1 can be referred to as the selection criteria. All data reflected in the following sections will be for the specific selection criteria.

Figure 26: Dashboard page.1, Section 1

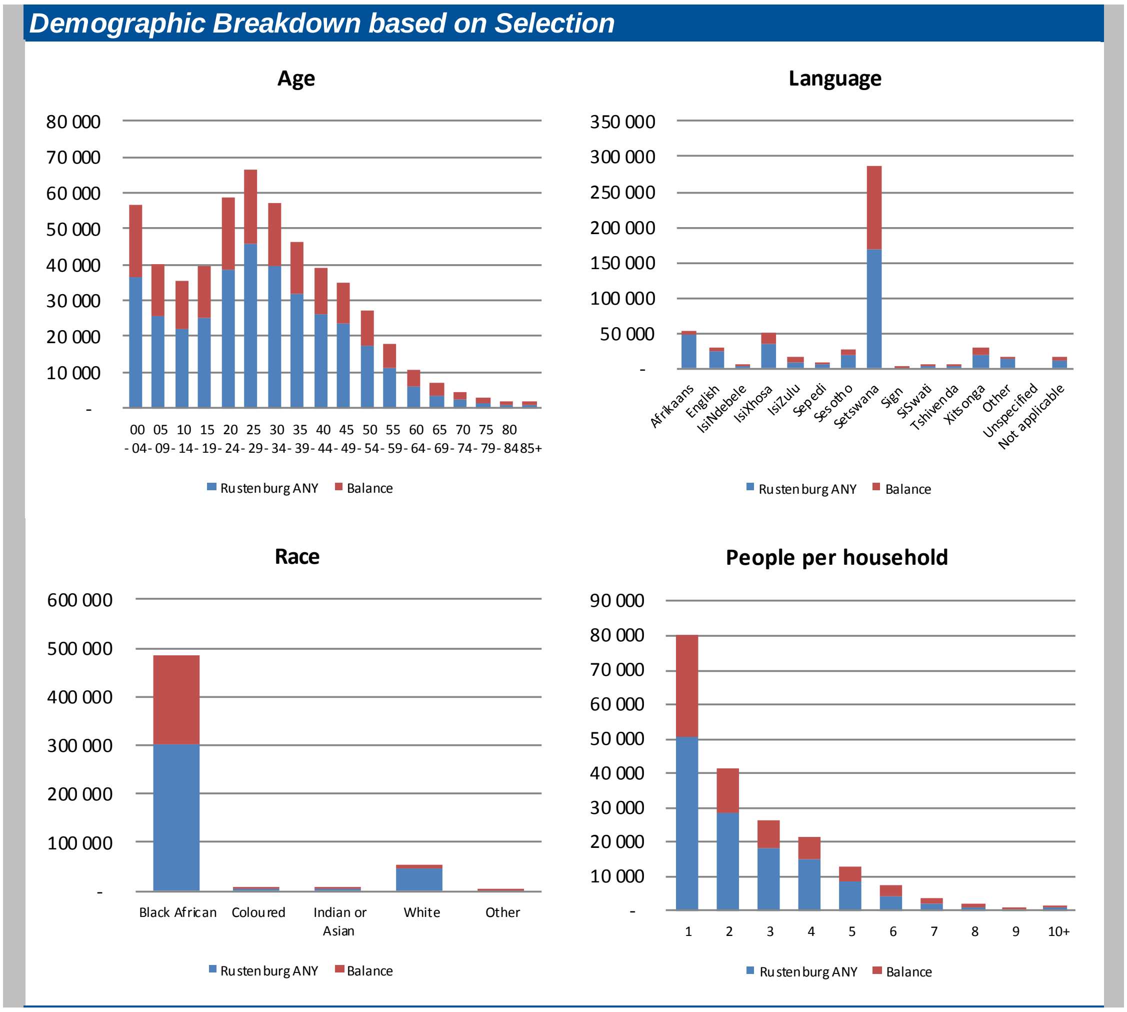


(Source: Own compilation)

An array of criteria or geographic selection can be done. This gives the user the ability to select between any one of the nine South African provinces and 234 municipalities which would be indicative of the geographic region in question. A selection can be made between any telecom retailer, which would then drive the opportunity indication per selected retailer. This selection includes eight telecom retail operators with an additional two selections, 'ANY' and 'NO'. Should 'ANY' be selected, the data returned will be encompassing all retailers in the geographic area. This indicates where 'ANY' retailer would be covering the market. Conversely, 'NO' reflects the inverse of 'ANY', where 'NO' telecom retailer is covering the market. A hyperlink is embedded in the earth globe on the right to navigate to an interactive map (requires internet access) which would allow for the spatial view of the results per municipal area.

In this example, ANY telecom retailer in Rustenburg, North West was selected in leading up to the case study that follows in section 3.6. Specific reasoning for selecting the case study is also incorporated. The second section on page 1 of the dashboard gives a view of the demographic breakdown based on the selection criteria and is represented in figure 27.

Figure 27: Dashboard page.1, Section 2

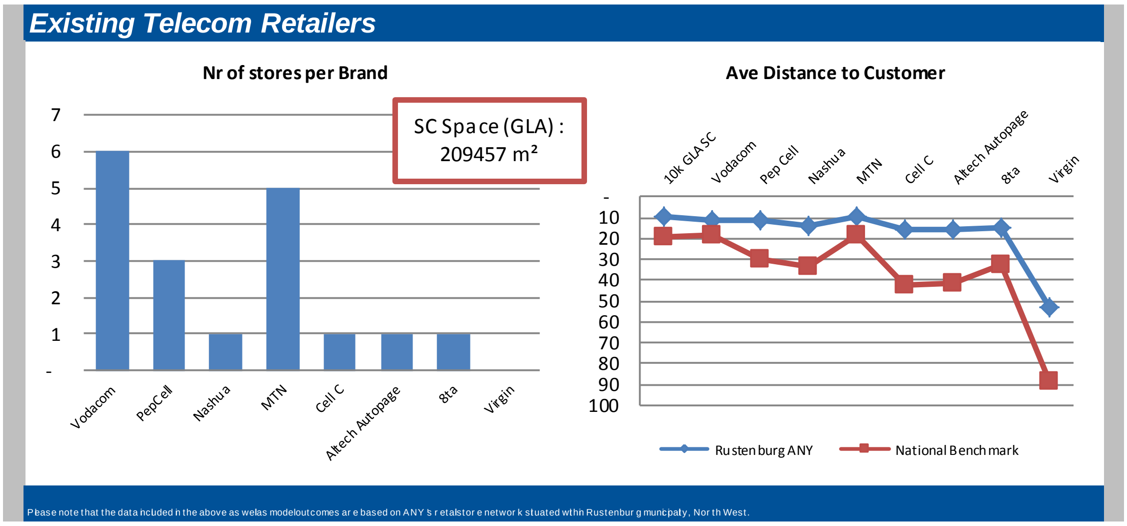


(Source: Own compilation)

This second section on page 1 includes graphs for age, language, race and people per household. This basic demographic breakdown can aid in categorising the total market to be targeted whilst indicating which portion of the market is not catered for and still offers opportunity. Mention can be made of what language should be used and what age group should be targeted in advertising campaigns. The number of people per household indicates the preferences of household expenditure and prioritise of household goods. For example, the lower number of people per household will drive a more aspirational shopper focused on luxury goods.

With reference to the selection criteria as per page 1 section 1, the blue bars in the respective graphs indicate the current coverage of 'ANY' (or the relevant selection) telecom retailer in Rustenburg municipality. The red bars indicate the balance of opportunity, outside current coverage of ‘ANY’ telecom retailer. This representation follows the same principle throughout the dashboard where blue indicate current coverage within the selection criteria and red indicating the balance or opportunity. However the exception applies when ‘NO’ is selected whereby the blue would then represent the opportunity where no telecom retailer currently cater for the demographic opportunity. This selection (‘NO’) is, however, not recommended for usage in an effort to avoid confusion as the labels on the graphs would not change from ‘balance’. Effectively ‘balance’ in a ‘NO’ scenario would indicate current coverage. It was decided that the ‘NO’ coverage selection still be included as this offers alternative capabilities for dashboard utilisation and application. Thus, ‘NO’ would in fact be the inverse result of ‘ANY’.

Figure 28: Dashboard page.1, Section 3



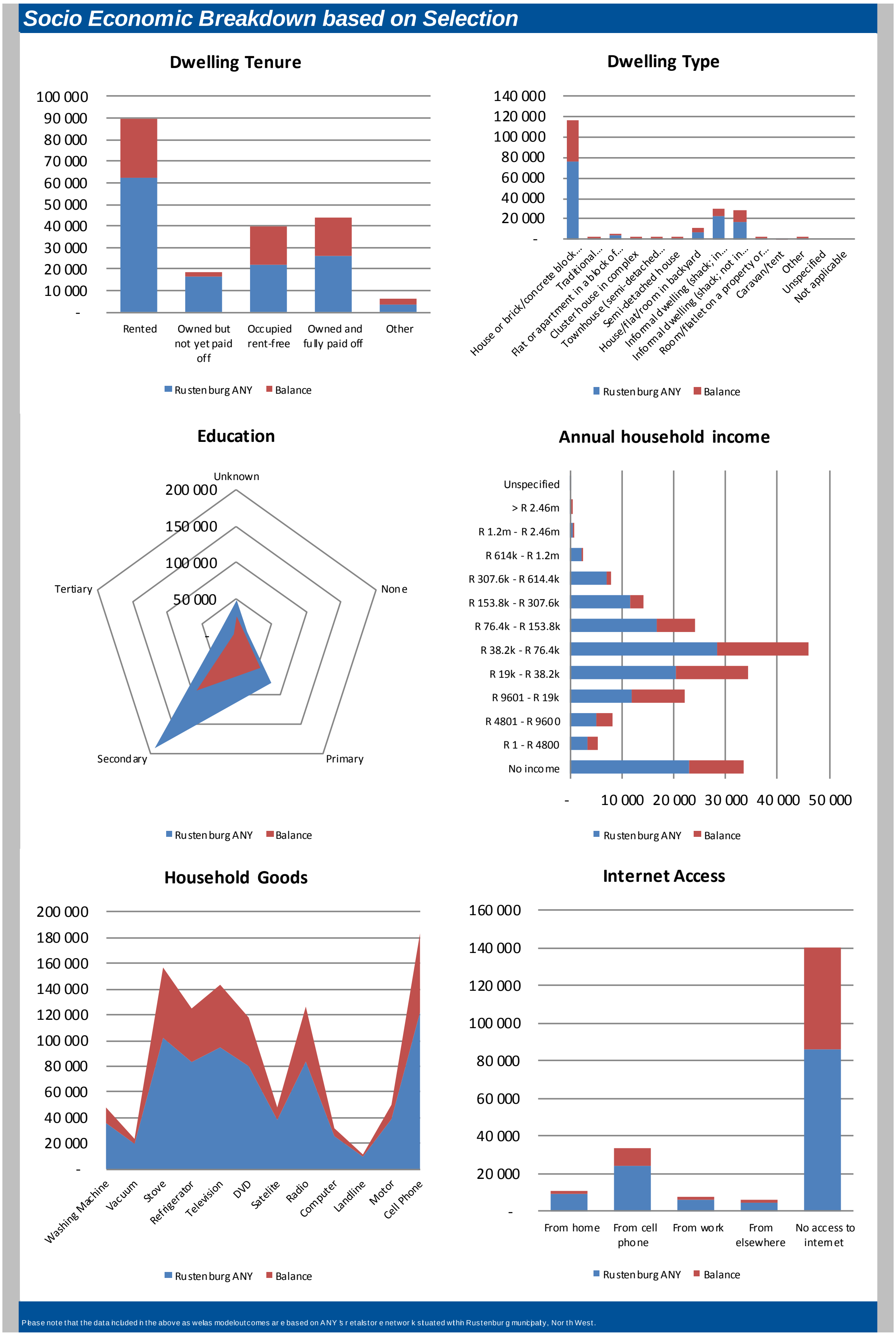
(Source: Own compilation)

Figure 28 is a visual representation of the last section on page 1 which refers specifically to telecom retailers. Two graphs in this section represent the number of retail stores per brand and the proximity (in km) of these stores to the potential customer. The number of stores is reflected for the geographical selection criteria. In this selection, the total number of stores is situated within the Rustenburg municipality. This graph cannot have a red portion as it will always be an ultimate number representing the actual number of stores. The top right block (in red) indicates the total GLA (m²) of formalised shopping centres in the analysis area or municipality selected. This value would also feed into summary calculations. The second graph refers to customer's proximity (average distance) to the respective telecom retailer and shopping centres greater than 10,000m² GLA. As mentioned, shopping centres larger than 10,000m² GLA were included as a benchmark to the proximity variable. The red line in the graph represents the national average or benchmark for that specific retailer. The blue line on the other hand represents the proximity within the geography selected.

This section offers the user the ability to view the number of competitors in the area with its proximity within the municipal area which is indicative of the spread of the stores in the area. The first indication that an area may require presence is where no stores exist from a specific retailer or brand. In this case Virgin Mobile is not represented in Rustenburg. Another indication that the area may require additional presence is within municipalities where the local proximity is further than the national average (blue line below red line). Although a Virgin Mobile is not present in Rustenburg, the average proximity is still lower than the national average as a Virgin Mobile is present in Brits, ±55km to the East. In this scenario, based purely on proximity and representation, it may be wishful thinking for Virgin Mobile to explore another opportunity before opening a store in Rustenburg. Conversely, the market size in Rustenburg could indicate differently.

The second page of the dashboard gives a municipal view of the socio-economic breakdown for the selection criteria. Six graphs give a visual breakdown of the dwelling type, dwelling tenure, education, household income, household goods and internet access. Similar to section 2 on page 1, the red portion of the graphs indicates the balance of the market not covered by telecom retail as per the selection. In essence, all data can be related to household income. For example, the ability of a household to buy a brick home is affected by its income which in turn can be related to the level of education obtained. Similarly, a household's ability to buy household goods is dependent on the income level of the household. This furthermore drives the household's internet accessibility, or lack thereof.

Figure 29: Dashboard page.2



(Source: Own compilation)

In this Rustenburg selection, it is evident that almost all households with landlines have telecom retail coverage opposed to only ±100,000 from a total of ±155,000 households having stoves are covered by telecom retail. It is furthermore clear that a higher percentage of people with primary education as their highest level are not covered when compared to people with a secondary level of education. Alternatively, when looking at the volume difference, more people with secondary levels of education are not covered. Lastly, a high volume of middle-income earners are not covered.

The first two pages summarise the current scenario through demographics and retail data. Page 3 starts to look at quantifying the market.

Figure 30: Dashboard page.3, Section 1

Telco Retail Opportunity based on Selection

Scenario Input variables

Enter values in the table below to populate Scenario; Scenario 1 is locked.

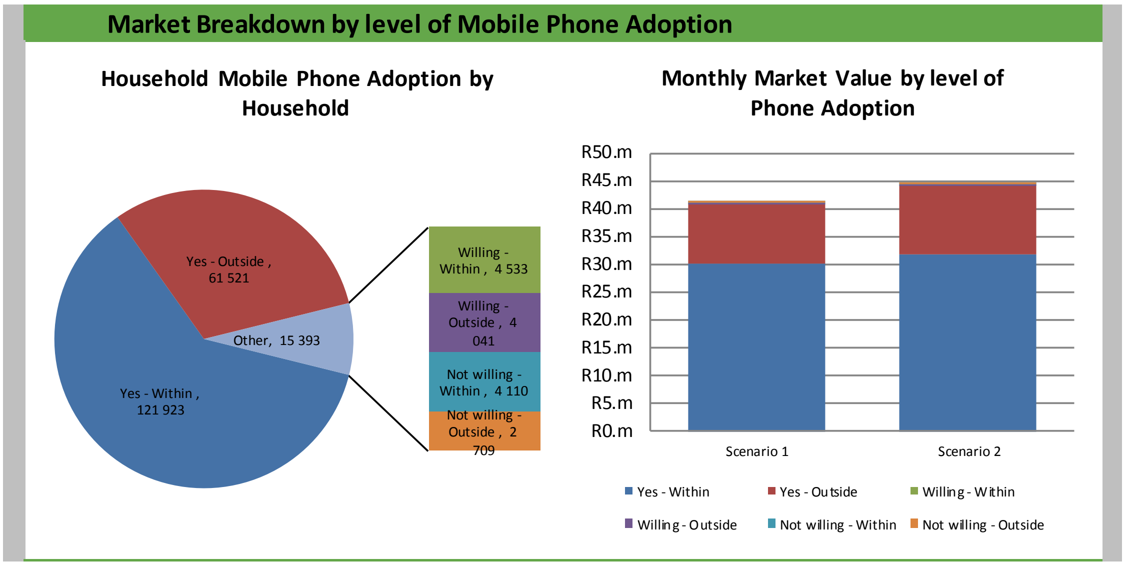
	Scenario 1: AMPS Data		Scenario 2: What if	
Annual Household Income	**ASPU**	**Nr Phones**	**ASPU**	**Nr Phones**
No income	1	1	*10*	*1*
R 1 - R 4800	44	1	*50*	*1*
R 4801 - R 9600	38	1	*50*	*1*
R 9601 - R 19k	45	2	*50*	*1*
R 19k - R 38.2k	55	2	*100*	*2*
R 38.2k - R 76.4k	77	2	*100*	*2*
R 76.4k - R 153.8k	118	3	*200*	*2*
R 153.8k - R 307.6k	186	3	*200*	*2*
R 307.6k - R 614.4k	304	3	*300*	*3*
R 614k - R 1.2m	304	3	*300*	*3*
R 1.2m - R 2.46m	304	3	*400*	*4*
> R 2.46m	304	3	*500*	*4*
Unspecified	44	1	*10*	*1*

(Source: Own compilation)

The first section on page 3 (see figure 30) gives the user the ability to enter values as part of a 'What if' scenario to quantify the total market opportunity. Scenario 1 based on AMPS data as explained previously, is locked and cannot be changed. The inclusion of two scenarios has been done in an effort to keep with literature but also to allow the user to insert data derived from internal company data. This would then also allow for the evaluation of the difference between the market sizes as per industry benchmarks compared to internal company data. The 'What if' scenario also allows for manual adjustments on market data allowing for changes in future demands influenced by average spend affected by fluctuating economic conditions and the number of simcards per household change as users become younger and more phones can be attributed to a household.

Another important factor to consider in this section is the level of mobile phone adoption and the market attributed to each level. Figure 31 represents this part of the methodology and and the second section on page 3.

Figure 31: Dashboard page.3, Section 2



(Source: Own compilation)

The second section on page 3 represents a market breakdown by the level of mobile phone adoption. This is done through two graphs (see figure 31) whereby the first graph represents households level of mobile phone adoption. This is done through a bar or pie chart. The pie chart as part of this bar is split into three slices which indicates the percentage split between:

- Yes – Within. These are households with existing mobile phone usage and within coverage (10km radius) of a telecom retailer;
- Yes – Outside. These are households with existing mobile phone usage however not covered by a telecom retailer;

- Other. These are households that have not yet adopted mobile phone usage.

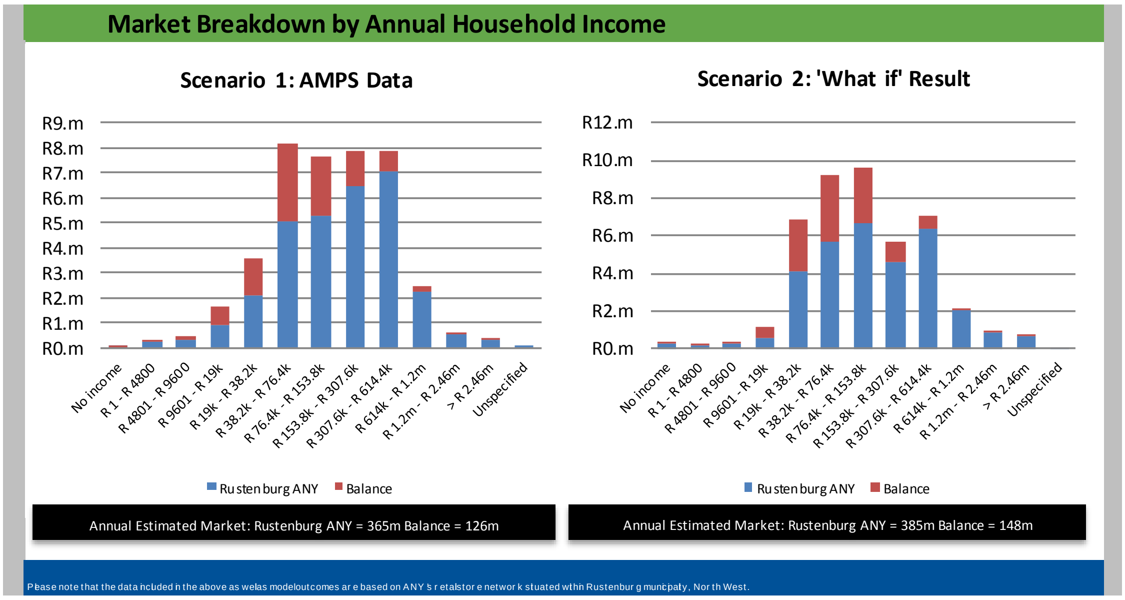
The ‘Other’ slice in the pie chart is then furthermore broken down as part of the bar of this bar and split into 4 segments which reflect the household’s willingness to adopt:

- Willing – Within. These are households without mobile phone usage but willing to adopt and within coverage of a telecom retailer;
- Willing – Outside. These are households without mobile phone usage but willing to adopt an outside coverage (10km radius) of a telecom retailer;
- Not Willing – Within. These are households without mobile phone usage and not willing to adopt but within coverage of a telecom retailer;
- Not Willing – Outside. These are households without mobile phone usage, not willing to adopt and outside coverage of a telecom retailer.

The second graph (bar graph on the left) represents the same data breakdown however gives a value representation opposed to a volume representation as in the first graph. Where the first graph gives a household view, this graph indicates the monetary view of the level of mobile phone adoption. This is based on the scenario input variables as per section 1 on page 3. Given the high levels of mobile phone adoption and usage in South Africa, the majority value breakdown in this graph will remain in ‘Yes – Within’ and ‘Yes – Outside’.

The last section (3) on page 3 indicates the monthly value that can be expected from each household income bracket as per the selection page 1 and the scenario input variables on the top of page 3 (see figure 32). Contrarily, the black summary boxes at the bottom of each graph indicate the annual estimated market per current coverage and balance of the market for example a balance of R126 million in the Rustenburg municipal area.

Figure 32: Dashboard page.3, Section 3



(Source: Own compilation)

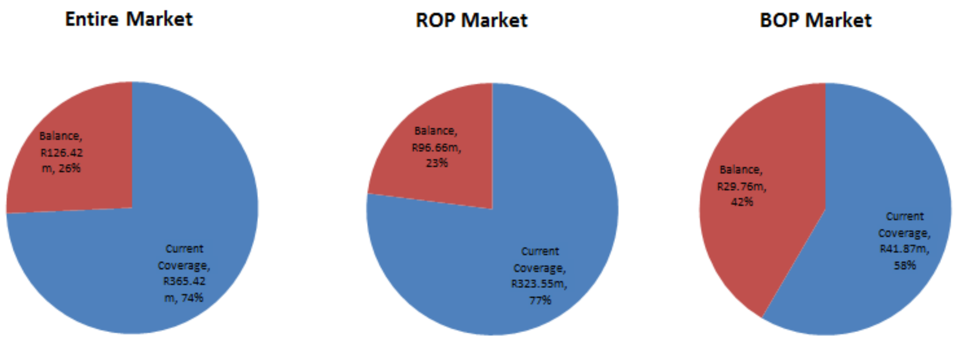
The final page (4) summarises the opportunity within the selection and data inputs. The total annual market or opportunity is indicated while giving the value of the current coverage. The balance of these two figures represents the opportunity telecom retailers can realise through expanding their current store footprint and ultimate coverage in catering to this market. The three pie charts in this section are based on the locked scenario 1 inputs and split the market into BOP and ROP indicating current telecom retail coverage and the respective balances thereof.

Figure 33: Dashboard page.4, Section 1

Summary

Total Market Breakdown by Segment

	Scenario 1	Scenario 2	
Annual Opportunity	R491.84m	R532.83m	*From entire Rustenburg Municipal area*
Current Coverage	R365.42m	R385.17m	*From ANY store Current Coverage*
Balance	**R126.42m**	**R147.66m**	



(Source: Own compilation)

In this selection of Rustenburg, 26% of the total market is not currently covered by telecom retail. This represents a R29.76 million annual opportunity at the BOP and R96.66 million in the ROP. The BOP is 58% covered while the ROP is 77% covered by telecom retail. The greatest opportunity still, however, exists in the 23% of the ROP compared to the value of the 42% in the ROP. The next section allows for a more detailed view and market share scenario application to the respective market segments (ROP vs. BOP).

Figure 34: Dashboard page.4, Section 2

Market Share on Balance

Anticipated Market Share		
BOP	**40%**	*Insert*
ROP	**20%**	*Insert*

	Value (Spend)		**Volume** (Simcards)	
Annual Market	**Scenario 1**	**Scenario 2**	**Scenario 1**	**Scenario 2**
BOP	**R11.9m**	**R17.45m**	**24 003**	**21 311**
ROP	**R19.33m**	**R20.81m**	**14 423**	**11 773**
Total	**R31.24m**	**R38.26m**	**38 426**	**33 084**

(Source: Own compilation)

Section 2 of the dashboard on page 4 (see figure 34) allows the user to insert a market share scenario for both the ROP and BOP. Thus, should the target market fall more within the BOP, then a 0% can be entered for the ROP. Based on these market share scenarios, the value of the anticipated revenue at the BOP and ROP as well as the number of simcards (volume) is indicated. Local market shares may, however, differ and should be assessed at a local level. Alternatively, this can also be seen as a 'What if' input variable.

The final section on page 4 (see figure 35) indicates a view of the area (municipality) in respective to the provincial levels of shopping centre space and telecom retailers in relation to households.

Figure 35: Dashboard page.4; Section 3

SC Market Indicators

Saturation Index

Indicator	**Municipal Value**	**Provincial Value**
Households per 1m² GLA	**0.95**	**1.21**
GLA for every Telco Retailer	**11 637**	**9 250**
SC Space (GLA)	**209 457**	**791 397**

Please note that the data included in the above as well as model outcomes are based on ANY's retail store network situated within Rustenburg municipality, North West.

(Source: Own compilation)

The greater the number of households per GLA, the more is it indicated that retail is centralised to a specific retail node or shopping centre. This can be influenced by either a higher number of households (demand) or a lower size of retail offerings (supply). Given that it is anticipated that the supply would only be in areas where the demand is greatest, it would be fair to deduce that the higher this number, the greater the opportunity. With a higher indicator in this variable, households have limited choices about where to shop which drives them to a central location, making the market easier to capture. Alternatively, more people would be supporting the centre given that the market has not yet been diluted as significantly when compared to the province overall. Conversely, the higher the GLA per telecom retailer indicate that the market has not yet been captured specific to telecom retail as such. In essence, these two figures can be seen as a saturation index when compared to the provincial average. Figure 35 also indicates the total formalised shopping centre space in the municipality and province. This is an indication of the prominence of the municipality in terms of the provincial retail offering.

In this example of Rustenburg, the households per 1m² shopping centre GLA is lower than the provincial average. This indicates that more retail stores (indicated by shopping centre GLA) are present in the Rustenburg municipal area when compared to the North West province. Thus, a variety of retail nodes could be present which dilutes support (or spend) at a single retail node making it more difficult to capture the market. Taking this in consideration, GLA per telecom retailer is higher in Rustenburg when compared to the province. This indicates that other centres may still exist to expand presence in the municipality which will be required to adequately cater to a dilution of the market between different retail nodes. At the same time, Rustenburg offers 209,457m² GLA formal shopping centre space. Using shopping centre space as a measure, Rustenburg can be seen as a prominent and important retail node in the given a 26% (calculated as 209,457m² divided by 791,397m²) representation of the retail market in the North West province.

The third and last sub-section of model outputs refers to the online spatial view of the market as determined by the methodology. This makes use of an elementary GIS to indicate final calculations. The spatial view further highlights the findings, thus offering an easy interpretation interface.

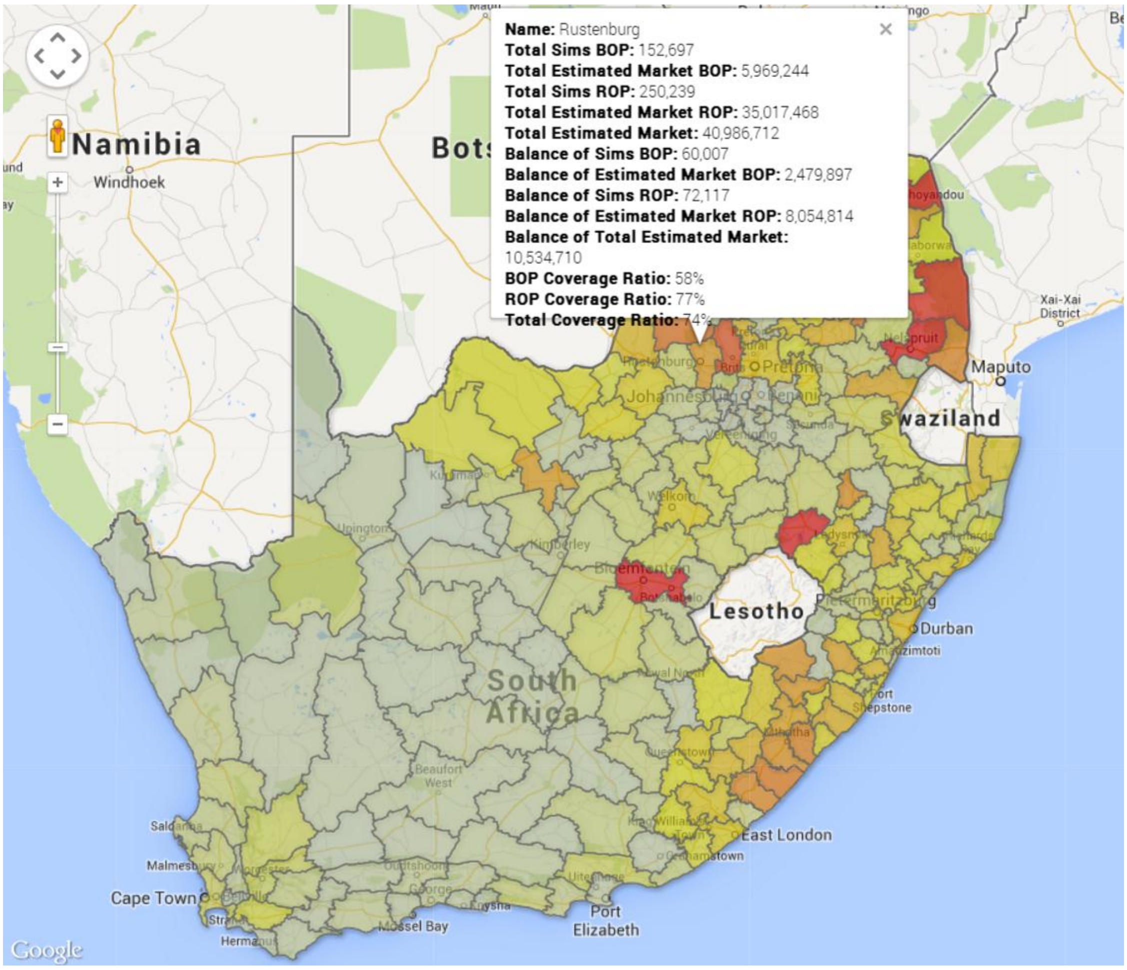
3.5.3.3 Spatial view of result

As alluded to earlier in section 3.5.3.2, an interactive spatial view forms part of the dashboard. This allows for a spatial view of an overview and summative findings of each municipal area. A summary of the market was extracted from the dashboard for each of the municipalities in South Africa. These data (demographics from Census 2011, municipal boundaries from the Municipal Demarcation Board, consumer indices from Eighty20 and GPS locations of existing telecommunication retail stores) were then reworked from MapInfo into a file compatible with Google Maps (Google Fusion Table). The latter allows for an online spatial view of opportunity. This result is housed online and visually presented in figure 36 below. By clicking on a municipal area, an information box will appear indicating the summative result of the dashboard calculation for each of the markets in the respective municipalities. The information box gives a view on the total market as well as the market not covered, and split between BOP and the ROP. Sub-categories include:

- Simcards (indicative of volume),
- Estimated market (indicative of value),
- Coverage ratio (indicative of telecom retailer presence).

In this example, Rustenburg's figures on the spatial view (online GIS) correlate with that of the dashboard as explained in section 3.5.3.2 with a BOP coverage ratio of 58% and ROP coverage ratio of 77%.

Figure 36: Spatial representation of the BOP not covered (through a GIS)



(Source: Adapted from Statistics South Africa, 2011 & Eighty20, 2013)

A case study forms part of this research in an effort to further validate the reasoning behind the methodology and possibility of entering a market (municipality) indicated by the model. The following section 3.5 deals with the case study selected.

3.6 THE MOSES KOTANE MUNICIPALITY AS CASE STUDY

Rogers (2005:201) listed five key reasons for investment and development of location research methods. These include:

- Avoiding mistakes which result in a loss of time and money,
- Prevailing through economic downturns and competitive changes,
- Catering for an ever increasing fragmentation and dilution of the market,
- Optimising existing investments, and
- Keeping up with changing demand across different geographies.

The majority focus on economic factors while two of these can be linked directly with the case study below. These are that the market is becoming increasingly fragmented whereby new retail nodes develop, which requires the maintenance and improvement of performance of the existing network. The latter suggests that even if demographic demand does not warrant a store, a relocation of existing stores should be considered in order to retain competitiveness.

Numerous shopping centre developments are proposed across the high opportunity municipal areas (within the top 20). These include Phuta Maluti Mall (Phutaditjaba) in Maluti a Phofong municipality, Botshabelo Mall in Mangaung municipality and The Ridge Mall in the Bushbuckridge municipal area. These offer additional opportunities to measure the model; however, the focus in this research is Moruleng Mall.

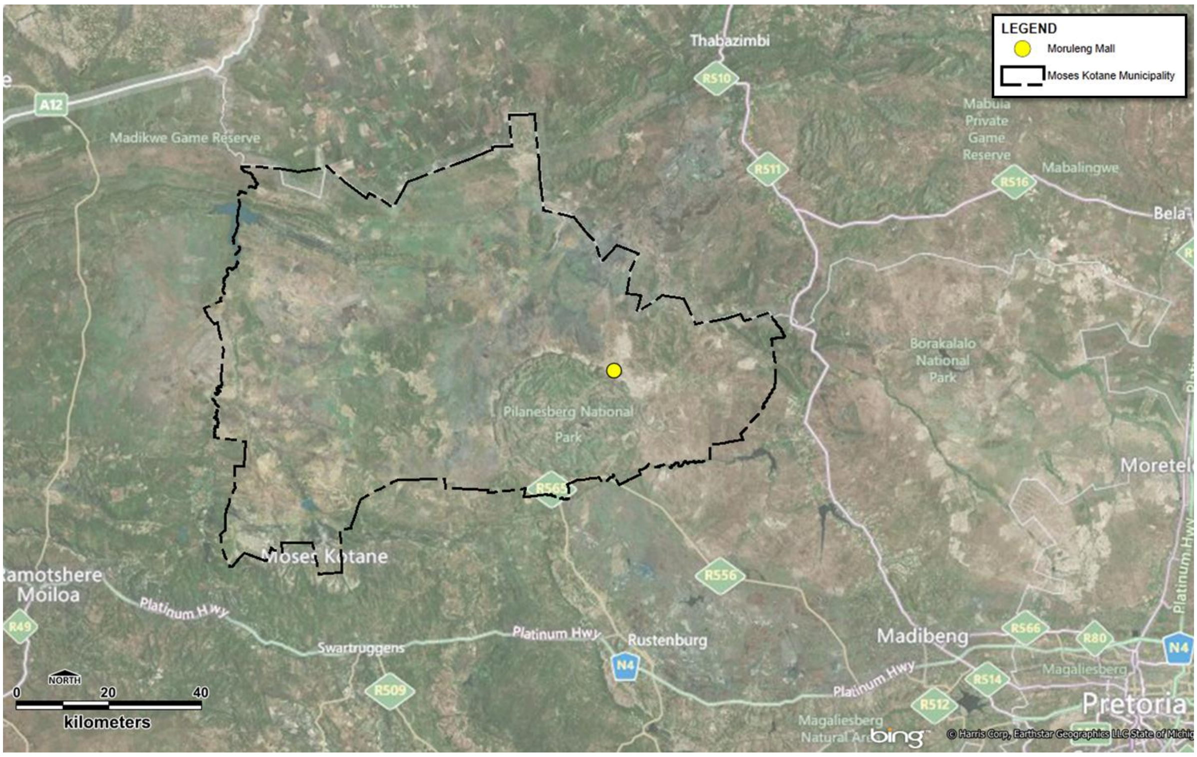
Table 17: Top 10 municipalities offering opportunity (not covered by telecom retail)

Municipality	Sum of Monthly Estimated Market
Mbombela	15 969 477
Madibeng	13 318 003
Makhado	13 165 696
Polokwane	13 152 687
Rustenburg	10 534 710
Maluti a Phofung	10 456 023
Mangaung	10 253 151
Thulamela	10 210 570
Moses Kotane	**9 923 056**

(Source: Own compilation)

A municipality was selected that offers a significant new retail development as well as a large opportunity as indicated in the model (opportunity summarised in table 17) reflected in the dashboard. A complete list of the opportunity by South African municipality can be viewed in Annexure G. Another important factor to consider was to select an area that is in relative close proximity to an existing retail offering in order to apply the gravity modelling principles (as in section 3.4.3.3). For this reason the Moruleng area within Moses Kotane municipality was selected as it is in close proximity to Rustenburg while the municipal area offers a significant potential market (within top 10 municipalities). Figure 37 indicates the location of the developing mall in relation to Rustenburg and other existing retail nodes.

Figure 37: Moruleng Mall orientation



(Source: Own compilation)

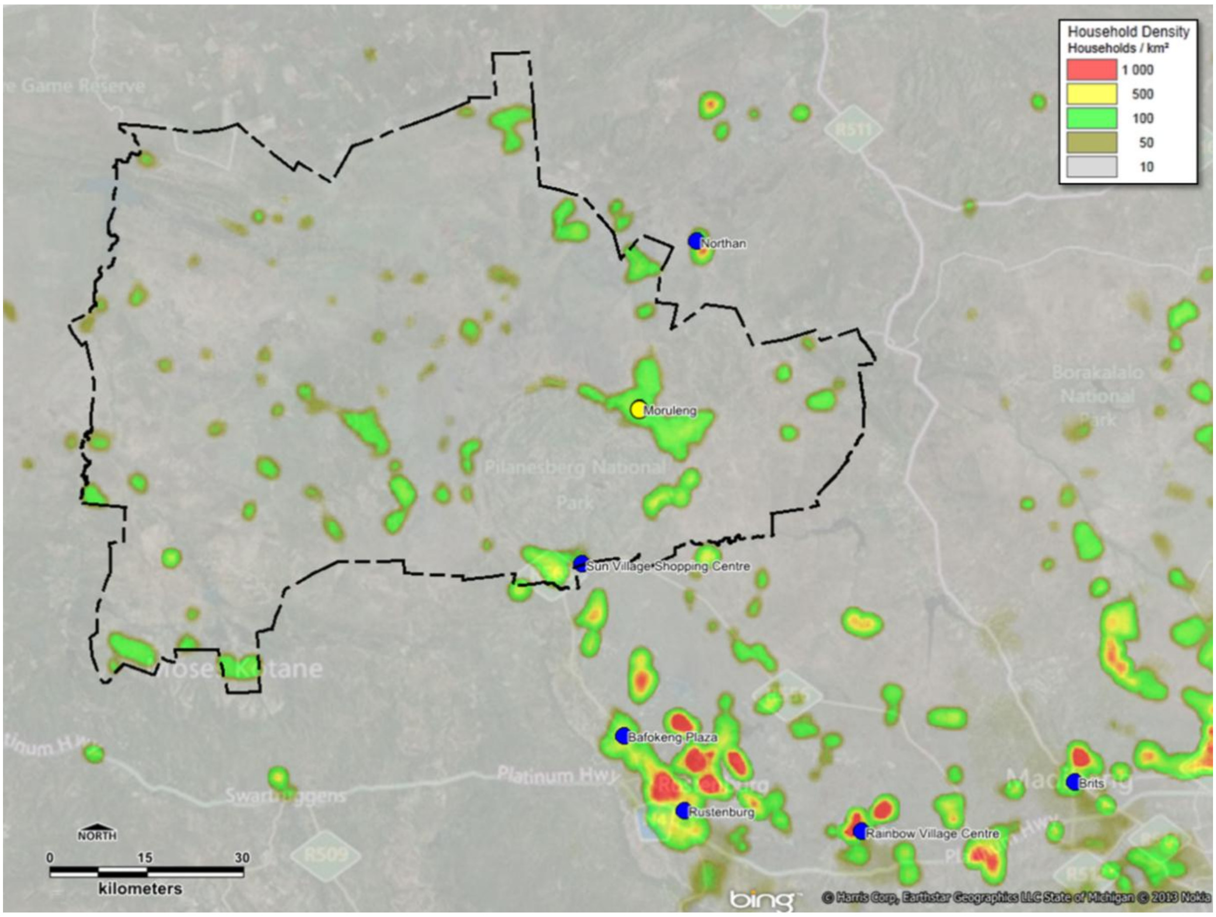
The next section aims at establishing a background to the development of Moruleng Mall and the area surrounding the site.

3.6.1 The development of Moruleng Mall

A new shopping centre is under development by New Africa Development (NAD), a company specialising in shopping centre developments with the majority of their developments in lower income or BOP areas. Moruleng Mall is under construction in the Pilanesberg area, North West. The mall is planned to be around 30,000m² GLA with Shoprite, Pick n Pay, Edgars, Foschini, Ackermans, Truworths, Legit, PEP, Totalsports, Sportscene, Markham, John Craig, Jet, Exact, Identity, Fashion Express and KFC tenanted in the centre. Thus, from the retailers, this can be seen as a significant retail development which would enjoy support from the greater Moruleng area. Given the significant opportunity indicated by the model in Moses Kotane municipal area, it is also important to understand the spread of this opportunity within the municipality. By representing Census 2011 data (number of households and income groups) spatially, allows for another dimension of data interpretation. Figures

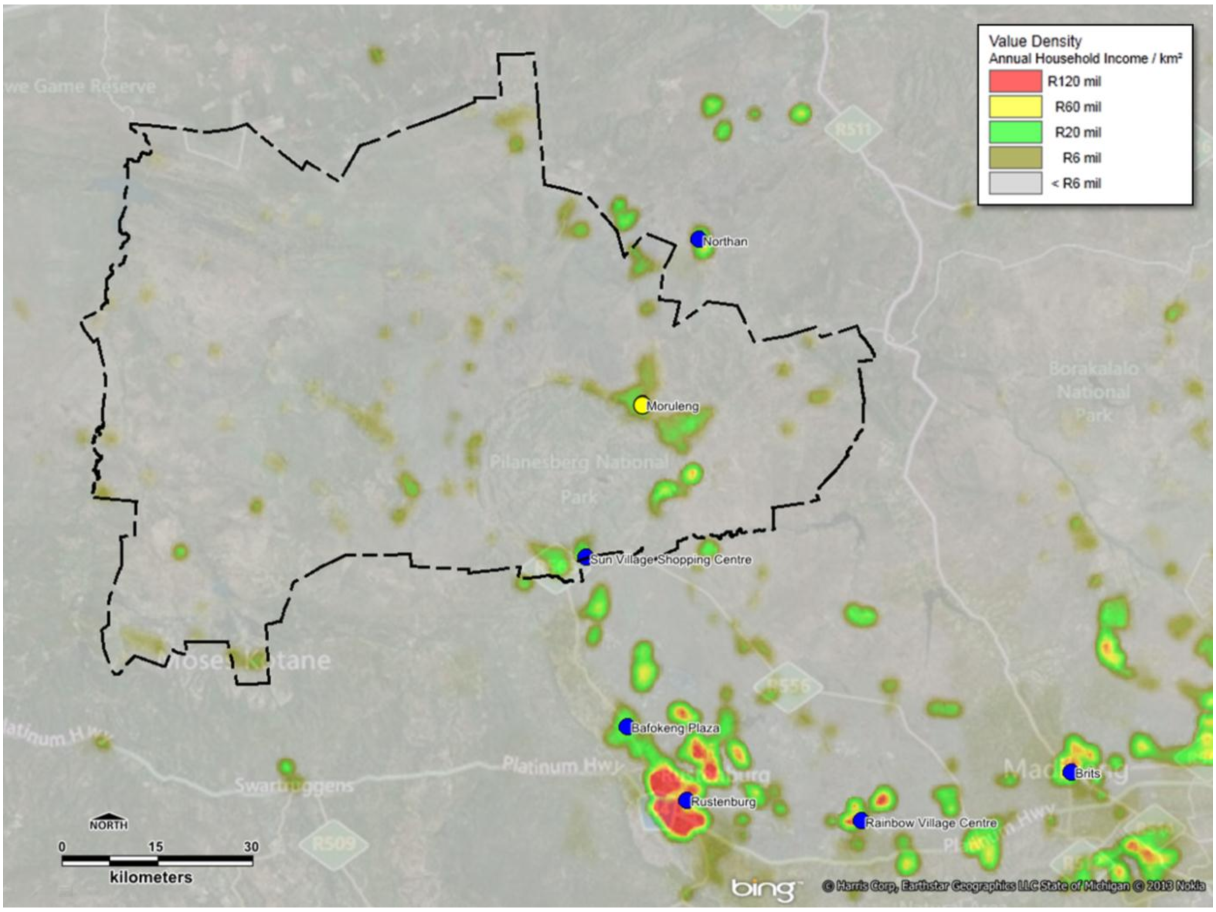
38 and 39 give a visual representation of this spread through a household density map as well as a value density map. Annexure H gives a national spatial view of household densities.

Figure 38: Household density map of Moses Kotane municipality and surrounds



(Source: Adapted from Statistics South Africa, 2011)

Figure 39: Value density map of the Moses Kotane municipality and surrounds



(Source: Adapted from Statistics South Africa, 2011)

The density of households indicates a clear higher density (cluster) in the formalised town areas such as Rustenburg. A more widely spread population is evident within the Moses Kotane municipal area. This, combined with lower income levels, drives a lower value density in the area with the highest (although still low compared to Rustenburg) value density around the site of Moruleng Mall.

With this development and establishment of a local retail offering, expenditure currently being spent in bigger retail nodes, such as Rustenburg, is anticipated to be localised. The lack of a local retail offering forces the Moruleng population to travel to Rustenburg or other similar larger retail nodes. Thus, the development of a local retail node in the form of Moruleng Mall will limit expenditure in traditional CBD areas where it is currently spent. The level of decreased spending in the latter areas will be dependent on the variety or significance of the retail offerings established locally. The following section focuses on the application of a more localised methodology utilised in micro-area analysis or in this case, a second-tier analysis.

3.6.2 Methodology: Moruleng second-tier analysis

As indicated earlier in the primary methodology section (3.4.3.2) of this chapter, gravity modelling was applied through the use of SiteMarker (within the MapInfo application) to this second tier of analysis. This allows for the trade area delineation of Moruleng Mall and its subsequent impact on an existing store's trade areas. A stepwise approach was followed as part of the SiteMarker software which ultimately allowed for reaching the required case study result.

3.6.2.1 Data preparation and variable selection

The use of the lowest level (SAL) of demand side demographic data in the tier 1 calculation enables the use of the same data. Demographic and ultimate demand data are part of the same dataset and thus already calculated. The selection criteria will, however, differ. The municipal area used in tier 1 will now merely be replaced by the trade area as determined. The supply data are, however, be further evaluated to determine ultimate trade areas for the retail supply in the smaller area of analysis. In order to determine trade areas specific to the relevant retail nodes the following variables were considered. These included:

- Gross Leasing Area (GLA) of the node in question;
- Number of telecom stores;
- Level of commercial activity.

The total leasing area for the different retail nodes were included as the first variable in determining the strength and prominence of the node or centre. Secondly, the number of telecom stores in the respective nodes was determined. This aids in establishing the prominence of the retail offering specific to telecommunication.

Another variable which should be considered is the local commercial activity. This can be done by looking at the regional gross domestic product. Rural, more informal areas are typically characterised by a lack of commercial activity and underlying industry to support the local residents which will ultimately feed into the disposable income of households. Given this lack in local job opportunities, the working population is forced to move into areas where work opportunities are available. Workers elsewhere then send money home to their households for living expenses which leaves little disposable income for higher order goods. Christaller's central place theory (Prinsloo & Prinsloo, 2004:214) can be used to explain the retail hubs or nodes in comparison with each other and thus the reason for lacking a commercial or industrial industry in the study area. A variable of 1 to 3 were attributed to the three main commercial nodes expected of having an influence on the development of Moruleng Mall. These were attributed as follows, primarily based on the distribution of GLA in the area which was used as indicator of commercial activity. The higher the value, the more prominent the commercial activity:

- 1 – Northam;
- 2 – Brits;
- 3 – Rustenburg.

3.6.2.2 Determining trade areas

Assigning levels of drive time (in minutes) was based on the benchmarking and findings of Prinsloo (2010). This dictates that super-regional centres experience a supporting area of up to a 30 minute drive time as included in Annexure A. Similar to the attribution of a commercial activity variable, the drive time was adjusted based on the level of commercial activity. As a result, Rustenburg was attributed a 40-minute drive time, 30 minutes for Brits and 25 minutes for Northam. Other smaller centres in the area of interest were attributed drive-time values based on the benchmark in the retail hierarchy. Table 18 below summarises the input data variables which will determine the significance of the retail node and ultimate attractiveness of the node for patronage.

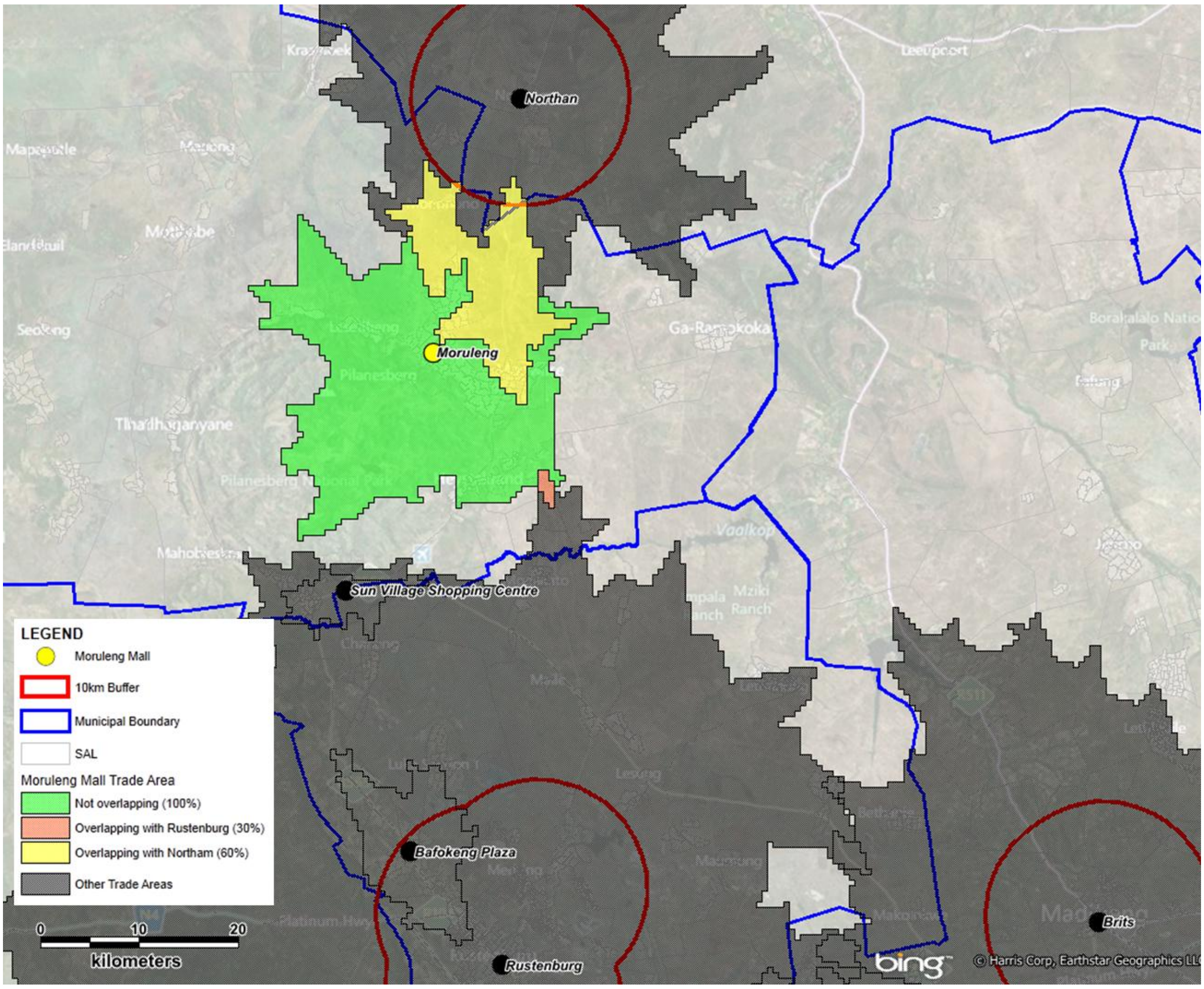
Table 18: Attractiveness variables of nodes

ID	Retail Node	Classification	GLA (m²)	Nr of Telco	Commercial activity	Longitude	Latitude	Drive Time
A1	Rustenburg	Town	184 818	17	3	27.241261	-25.670813	40
A2	Brits	Town	54 705	8	2	27.784479	-25.635166	30
A3	Northan	Town	19 004	2	1	27.2584	-24.9564	25
A4	Rainbow Village Centre	Centre	5 000	0	0	27.488	-25.6973	3
A5	Sun Village Shopping Centre	Centre	10 500	0	0	27.0997	-25.3623	7
A6	Bafokeng Plaza	Centre	18 000	0	0	27.1582	-25.5773	10
A7	Moruleng	Centre	30 000	2	0	27.178687	-25.166424	25

(Source: Own compilation)

These variables were subsequently entered to SiteMarker which first determined the drive time based on existing road networks. Secondly a grid of 110,960 500mx500m cells was created. This allowed for the application of variables to each of the grid cells within the drive areas. Where drive-time trade areas overlapped, the probability of people from a certain grid cell to frequent a specific node was determined. The ultimate result from SiteMarker is indicated in figure 40.

Figure 40: SiteMarker Result



(Source: Own compilation)

From the above it is clear that the largest overlap of Moruleng Mall's trade area will occur with Northam. Some overlap is anticipated with Rustenburg – however, to a much lesser extent. This also indicates that the main competing node will be Northam and not Rustenburg, given the proximity differences. From the calculations as a result of the attractiveness variances, the model determined that the population from the area overlapping with Northam (yellow on map) would have a 60% probability to transact at Moruleng Mall while the balance of 40% would still travel to Northam. Similar calculations in the overlapping area with Rustenburg (orange on map), found a 30% probability that the population in this area would frequent Moruleng Mall.

3.6.2.3 SiteMarker result comparison with dashboard output

Comparing the value of Moruleng Mall trade area with that of Moses Kotane municipal area may be somewhat skewed as Moruleng Mall's trade area moves somewhat into the Thabazimbi municipal area. However, this is to a very limited extent and will be disregarded for the purpose of this comparison. Table 19 summarises the total result, irrespective of coverage or not, from the dashboard (Tier 1 analysis) as well as that from SiteMarker (Tier 2 analysis).

Table 19: Comparison between municipality and Moruleng trade area

Area	Sum of Sims BOP	Sum of Estimated Market BOP	Sum of Sims ROP	Sum of Estimated Market ROP	Total Sims	Total Market
Moses Kotane	78 006	R 3 072 515	57 915	R 7 227 064	**135 922**	**R 10 299 580**
Moruleng Mall Coverage	19 093	R 749 339	25 256	R 3 282 734	**44 349**	**R 4 032 073**
Percentage	*24%*	*24%*	*44%*	*45%*	***33%***	***39%***
Moruleng Mall Market	17 533	R 689 854	23 260	R 3 043 001	**40 793**	**R 3 732 855**
Percentage	*22%*	*22%*	*40%*	*42%*	***30%***	***36%***

(Source: Own compilation)

The above table indicates that 24% of the BOP (by volume metric) in Moses Kotane municipality will be covered should a telecom retailer open here. Similarly, 45% of the ROP and an ultimate 39% of the total market value can be covered in Moses Kotane municipality. Taking the probability of patronage into account (based on the result from the gravity modelling in SiteMarker), 36% of the total market could be catered for. This results in a potential ±3% outflow of localised telecom expenditure. For the sake of clarity, Vodacom currently has a retail presence in Rustenburg. Should they not open a store in Moruleng Mall and MTN does, Vodacom stand to potentially lose 97% of its current clientele from the area in question should all of its customers move to a localised provider with a store in Moruleng Mall. This is obviously a worst case scenario and subject to external factors to retail such as cost of airtime or packages and localised signal coverage. However, the fact remain that theoretically based on gravity model, a large portion of the market could be seen as vulnerable.

From table 19 it can also be deduced that although the municipal area could be seen as rural and therefore establish a misconception that only lower income groups are represented, the majority of the market is still reflected outside of the BOP. Thus, the majority of the opportunity is in fact part of the ROP. Almost half of the ROP is located in close proximity to the development. This suggests that the BOP is located further afield in Moses Kotane municipal area, outside Moruleng Mall trade area. The trade area was determined to be ±600km² with a municipal area of ±5,700km². This reflects a physical coverage of ±10% while the market is covered by ±40%.

3.6.3 Case study findings

As alluded to earlier in section 3.5.2.4, the buffer area was determined at 10km. From this case study it is clear that support for the different centres or retail nodes could be much greater when based on drive times. Prinsloo (2010) indicated that rural retail may demand support of up to an 80km radius while towns could experience support of up to 50km. Although the values in the opportunity calculation may differ, the result is not expected to influence the ultimate outcome significantly in terms of opportunity distribution. This means that the municipalities with currently greatest opportunity will remain the same whilst the values thereof may differ.

Evident from the case study is that shopping centre developers are beginning to focus on lower value, higher volume markets through exploring new demographic markets. Traditionally retail was established in CBD / high street stores within smaller towns. A further limiting factor to consider is local demand dilution as a result of support to more prominent retail nodes (main towns or smaller cities) in the area. By introducing formal retail into the traditional rural and lower income areas, it essentially intercepts expenditure previously spent in main town CBD's, thus diluting the retail expenditure (Rogers, 2005:201). This emphasises the requirement for formal retail to 'follow' centre developments.

The case study supports the findings that removed or more rural areas can offer viable opportunity for retail expansion. Although not all of the opportunity can be captured at one retail destination, it still captures the majority of the market which drives the feasibility for telecom retailers. Should another store not be feasible taking the greater area into consideration, a relocation could be considered to realise optimal distribution of retail stores to cater to the majority of the market. This furthermore allows for a competitive advantage. The total market of ±R3.7mil per month (indicated in table 19) indicates a significant opportunity cost for not opening a localised retail offering. Very interesting to note is that the ROP contributes 81% to the total market for Moruleng Mall. Thus, it can be seen that in this case, it is rather the rural area offering opportunity opposed to the BOP.

3.7 SUMMARY

GIS can aid in establishing a competitive advantage as input into the strategic decision-making process. Section 3.2 highlights the fact that Reliance (India) has achieved such advantages which drive competitiveness and ultimately market share. Dashboards further aid in combining and utilising business and market data, speeding the decision-making process. In order to apply GIS and the ultimate development of the dashboard certain datasets and software were required. These included:

Three tiers are recommended for adequately assessing telecom retail investment in a specific site. This chapter looked at two of these – high level analysis based on municipal areas (tier 1) and shopping centre specific (Moruleng Mall as tier 2). The last tier is to assess the micro-site details. This was however not considered for part of this empirical investigation.

The methodology applied as part of the ultimate model in quantifying the opportunity can be viewed in three steps. This includes (1) input data that were then (2) reworked in the data modelling step which ultimately resulted in (3) the model output. Input data encompassed demographic and retailer data. The demographic data were used to determine market demand whilst retailer data represented the supply function as part of a market equilibrium indicator. Data modelling made use of software to rework the input data through applying a multiple regression model as well as industry consumption (volume) and expenditure (value) research. Similar to the findings of Chip *et al.* (2012), the regression model indicated a positive result between mobile phone ownership and other household goods. Finally, the results were represented in a dashboard and online GIS (Google Maps) for easy interpretation and analysis.

A positive correlation was achieved between the market calculated as per the methodology applied in the empirical investigation to that reported in other research. The BOP market as determined has a positive comparison to that of Hammond *et al.* (2007); however, the total market determined has a greater difference. Numerous reasons for this difference can be given. The fundamental difference can, however, be attributed to the difference in markets assessed. The empirical investigation focuses on the mobile market from demographic usage opposed to the research of Hammond *et al.* (2007) focusing on ICT. The ICT market encompasses the total market and usage. This includes business and consumer (demographic) as well as fixed line and mobile phone.

Gauteng is almost fully covered by telecom retail. Limpopo, on the other hand, has the largest percentage of households not covered by telecom retail, 70%. In all provinces the BOP has a greater coverage ratio (percentage) compared to the ROP. This drives the question as to whether opportunity is in fact the BOP and rather not the rural areas typically not covered. This notion is furthermore fuelled by the size of the respective markets – BOP vs. ROP. Even though the BOP not covered offers a greater volume (R247 million per month through 5.8 million simcards), the value still lies in the ROP (R379 million per month through 2.8 million simcards).

All data pertaining to the analysis as well as data used to establish a demographic breakdown were included in the dashboard. This gives a holistic view of respective markets based on the selection criteria. The development of a dashboard and spatial view through an online mapping server (Google Maps) enables the easy view and analysis of an otherwise complex dataset.

The case study highlights that it is in fact possible to cater for this market through the development of a retail offering in decentralised nodes (shopping centres). At the same time it takes the application of GIS technologies into the next tier of analysis (tier 2). Thus, further indicating how the application of GIS technologies and theories can establish a competitive advantage. By establishing a telecom retailer within Moruleng Mall, 39% of the Moses Kotane municipal market (value) can be covered with a theoreticised support from 36% of the total municipal market.