



Regulation of international mobile roaming in the Southern African Development Community

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Abstract

The Southern African Development Community (SADC) experiences high levels of cross border human traffic due to trade, cultural and language links across the fifteen countries. Technological advances and increased domestic competition have contributed to lower domestic retail tariffs for mobile cellular services. Unfortunately, this has not extended to international mobile roaming (IMR) retail tariffs which remain unacceptably high. These high tariffs have attracted harsh criticism from commentators and prompted calls for regulatory intervention.

This study investigates the level of international mobile roaming (IMR) retail tariffs, usage and demand elasticity. It further considers whether competition or regulation play a greater role in reducing these tariffs and whether regulatory intervention is likely to reduce competition.

The research took the form of a quantitative study and used an online survey questionnaire as the data collection tool.

The results of the study confirmed that international mobile roaming (IMR) retail tariffs are indeed high, resulting in poor uptake by cost conscious travellers who pay for their own cellular usage. The finding that competition plays a greater role than regulation in reducing IMR retail tariffs is not significant.

It was concluded that neither competition nor regulation are sufficient on their own to provide increased social welfare. The best result is obtained when competition is allowed to flourish, underpinned by an enabling regulatory framework.

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Keywords: Southern African Development Community, Mobile communications, Regulation, International mobile roaming, Competition

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Name: Mortimer Hope

Signature: _____

Date: 10 November 2010

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1. PROBLEM DEFINITION

1.1. Research title

Regulation of international mobile roaming in the Southern African Development Community (SADC).

1.2. Introduction

Mobile network operators (MNOs) worldwide are facing increasing calls from consumers, regulators and politicians to reduce the high retail tariffs of international mobile roaming (IMR) calls. The Organisation for Economic Co-operation and Development (OECD, 2009) suggests that technological advances and increased domestic competition have contributed to lower domestic tariffs and raised expectations of a similar drop in international mobile roaming tariffs. This tariff reduction has not materialised, prompting Southwood (2006, pg. 3) to refer to African roaming charges as “legal daylight robbery” and Apostolou (2009, pg. 1) to comment on the European Union (EU) regulation to halt “roaming rip-off”.

The International Telecommunication Union (ITU, 2008) argues that foreign visitors to India can pay as much as 30 times the local tariff for a similar call. This is supported by Table 1 which shows that a South African subscriber who roams in India would pay between 14 and 16 times the tariff paid by an Indian subscriber of Vodafone Essar when placing an identical international voice call to South Africa. This multiple rises as high as 47 times for a local call within India and 89 times for accessing mobile data. SMS roaming is relatively inexpensive – ranging between 4 and 6 times the tariff for a local Indian subscriber. Appendix 1 shows the tariffs for a Vodafone Essar prepaid user in

Mumbai, while Appendix 2 contains details of the roaming tariffs for the South African subscribers of Vodacom, MTN and Cell C who visit India.

Table 1: Comparison of tariffs for identical calls made by South African roamers and locals in India

	Vodafone Essar - non roaming	Vodacom roaming on Vodafone Essar	Vodacom roaming on other network	MTN roaming	Cell C roaming
International voice call from India to South Africa					
Tariff per min in local	INR 10.00	R 21.15	R 23.50	R25.50	R22.60
Tariff per min in USD	0.23	3.04	3.38	3.67	3.25
No. times higher		13.5	15.0	16.3	14.4
Make local voice call within India					
Tariff per min in local	INR1.50	R7.20	R8.00	R8.25	R11.19
Tariff per min in USD	0.03	1.04	1.15	1.19	1.61
No. times higher		30.7	34.1	35.1	47.7
Receive voice call in					
Tariff per min in local	INR 0.00	R6.00	R6.00	R4.00	R19.69
Tariff per min in USD	0.00	0.86	0.86	0.58	2.83
Data, per MB					
Tariff in local currency	INR	R 17.50	R128.00	R140.00	R 120.32
Tariff in USD	0.23	2.52	18.43	20.16	17.32
No. times higher		11.2	81.8	89.4	76.9
SMS to South Africa					
Tariff in local currency	INR 5.00	R2.75	R 2.75	R2.75	R 4.57
Tariff in USD	0.11	0.40	0.40	0.40	0.66
No. times higher		3.5	3.5	3.5	5.8

Source: Vodafone Essar prepaid SIM package; websites of Vodacom, MTN and Cell C

These high retail mark-ups prompted Lars P. Reichelt, CEO of Cell C – the third largest mobile operator in South Africa with 10% market share (BMI-Techknowledge, 2010), to say that international travellers would be better off purchasing a SIM card from an operator in the foreign country instead of roaming (My ADSL, 2010).

MNOs position this service as a convenience for international travellers, but the reality is that it is viewed as a grudge purchase by customers after the initial bill shock (Punnoose, 2010). A grudge purchase is when someone is forced to buy a good or service because they have no choice e.g. calling a plumber to repair a burst pipe. The Commission of the European Communities (CEC, 2008) describes bill shock as the situation where a roaming customer performs relatively simple tasks which are competitively priced at home, e.g. surfing the internet or downloading emails on the handset, then later receives an unexpectedly high bill – sometimes in the order of thousands of Euro.

Both parties in the roaming relationship suffer since angry customers may cancel their subscriptions or reduce roaming usage, while MNOs have to institute debt collection measures and face extremely negative media reports. This has resulted in some commentators labelling MNOs as greedy companies (Punnoose, 2010), that “mutually exploit each others’ customers” (Gillwald & Muriethi, 2009, pg. 20).

OECD (2009) states that some MNOs also feel that international mobile roaming tariffs are unjustifiably high. These MNOs feel that the high roaming tariffs cause damage to their customer relations and reputation. Lars P. Reichelt, CEO of Cell C, was even moved to say that his company could not do much to reduce the high roaming tariffs because “it is a cartel” (My ADSL, 2010). Wikipedia (2010) describes a cartel as a formal agreement among competing firms to fix prices.

Gillwald and Muriethi (2009), and OECD (2009) suggest that MNOs that are commercially strong in their domestic markets will not voluntarily reduce

international roaming tariffs, unless they are faced with disruptive technologies, services or business processes that threaten to replace their established approach to providing that service. This was demonstrated in September 2006 when Zain (then known as Celtel) cellular network introduced its One Network service in three East African countries – Tanzania, Kenya and Uganda. In these countries Zain faced strong competition from Vodacom, Safaricom and MTN respectively, along with pressure from government which wanted to introduce additional competition in order to reduce domestic retail tariffs. Zain sought to leverage its competitive advantage of a presence in all three markets to respond to an ongoing loss of market share in the individual countries (Gillwald & Muriethi, 2009) by providing a compelling value proposition through the removal of the roaming surcharge in these countries. In effect Zain merged the three separate national networks into a single cross border network for its customers.

The literature shows that the Inter-operator Tariff (IOT), the wholesale tariff which the visited network charges the home network of a roaming subscriber, is the largest contributor to the retail tariff of the roaming service (OECD, 2009). High retail mark-ups by the home MNO are also a contributing factor to high retail tariffs (Sutherland, 2001).

This research project will examine subscriber usage patterns of international mobile roaming (IMR), whether they perceive that competition has succeeded in reducing IMR retail tariffs and whether regulation of IMR is likely to succeed in the Southern African Development Community (SADC), to which South Africa

belongs. It further examines the likely effect of regulation on consumers and mobile operators.

International mobile roaming is explained later in section 2.2 of this research project, while regulation is explained in section 2.8.

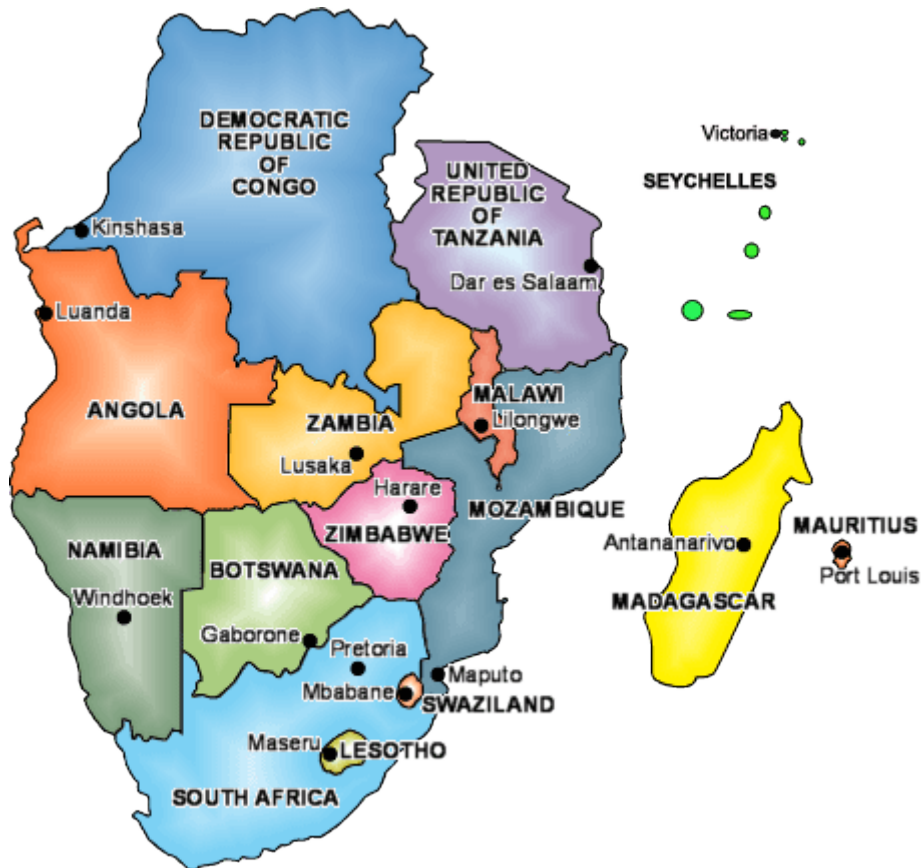
1.2.1. Southern African Development Community

The Southern African Development Community (SADC) has been in existence since 1980 when nine Southern African countries, the so called “frontline” states in the fight against apartheid, joined forces in an effort to reduce their economic dependence on South Africa (SADC, 2010; McCormick, 2003). Over time the entity expanded its membership to include more countries and gained a legal charter when it changed from a coordinating conference to a development community. The current SADC member countries are Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe (McCormick, 2003).

Figure 1 shows the various countries in SADC on a map of the region.

Data for the Seychelles is not included in SADC summaries by some entities such as Statistics South Africa. This exclusion of the Seychelles does not materially affect the results since its population, which is less than 100 thousand, is less than 0.1% of the SADC population.

Figure 1: Map showing SADC countries



Source: WHL Consulting, 2010

1.3. Research problem

Intra regional travel is high among SADC residents but usage of international mobile roaming (IMR) is disappointingly low. This research project investigates ways of increasing IMR usage in order to strengthen regional integration and increase cross border trade in telecommunication services.

It further seeks to prove that self regulation of international mobile roaming (IMR) has not resulted in reduced tariffs, and that regulatory intervention is likely to have the desired effect of lowering international mobile roaming retail tariffs. A sufficiently large retail tariff reduction will lead to increased consumer

demand, resulting in increased consumer and producer surpluses thereby increasing total welfare.

This research project aims to answer the question – *“Has competition delivered increased welfare to both operators and consumers or is it time to regulate international mobile roaming in the SADC region?”*

2. LITERATURE REVIEW

2.1. Introduction

The literature is reviewed in three sections – international mobile roaming, welfare impact, and regulatory intervention. Some possible remedies for reducing international mobile roaming tariffs are then considered.

OECD (2009) explained that International mobile roaming (IMR) is the ability of a mobile phone subscriber to use their existing account and handset on networks in another country and to be billed for this usage by their home network. The roamer's home network pays a wholesale tariff, known as the inter-operator tariff (IOT), to the visited network then adds a mark-up when billing its subscriber (Sutherland, 2001).

The retail tariff often bears no resemblance to cost and can be as much as 20 times higher than the tariff of an identical non-roaming call (OECD, 2009; Falch, Henten & Tadayoni, 2009). The mark-up set by each home operator varies by destination and can even vary by operator in each country (OECD, 2009). The International Telecommunication Union (ITU, 2008) explained that roaming is considered a premium service – hence the high mark-up. The IOT is usually high where there is a small number of competitors (mobile operators) in the foreign country (Falch *et al.*, 2009).

2.2. Definition of international mobile roaming

2.2.1. Technical explanation of GSM roaming

Figure 2 and the Box 1 provide a technical explanation of international mobile roaming (IMR) using GSM technology. The GSM Association (GSMA, 2010), an

industry body which represents the interests of nearly 800 GSM mobile network operators (MNOs) from 219 countries, including MNOs from all SADC countries, explained that GSM is an abbreviation for Global System for Mobile communications. This is a second generation digital mobile technology that was developed in Europe and spread worldwide, accounting for over 4.5 billion subscribers worldwide in October 2010 (GSMA, 2010).

In order for roaming to take place the international traveller's home network must have a roaming agreement in place with the visited network and the subscriber must be authorised to roam (ITU, 2008; Falch *et al.*, 2009). Additionally, Sutherland (2001) explained that the traveller's handset must be capable of operating on the frequencies, e.g. 900 MHz, 1800 MHz, 1900 MHz or 2100 MHz (3G), and technology (GSM in this case) of the visited network.

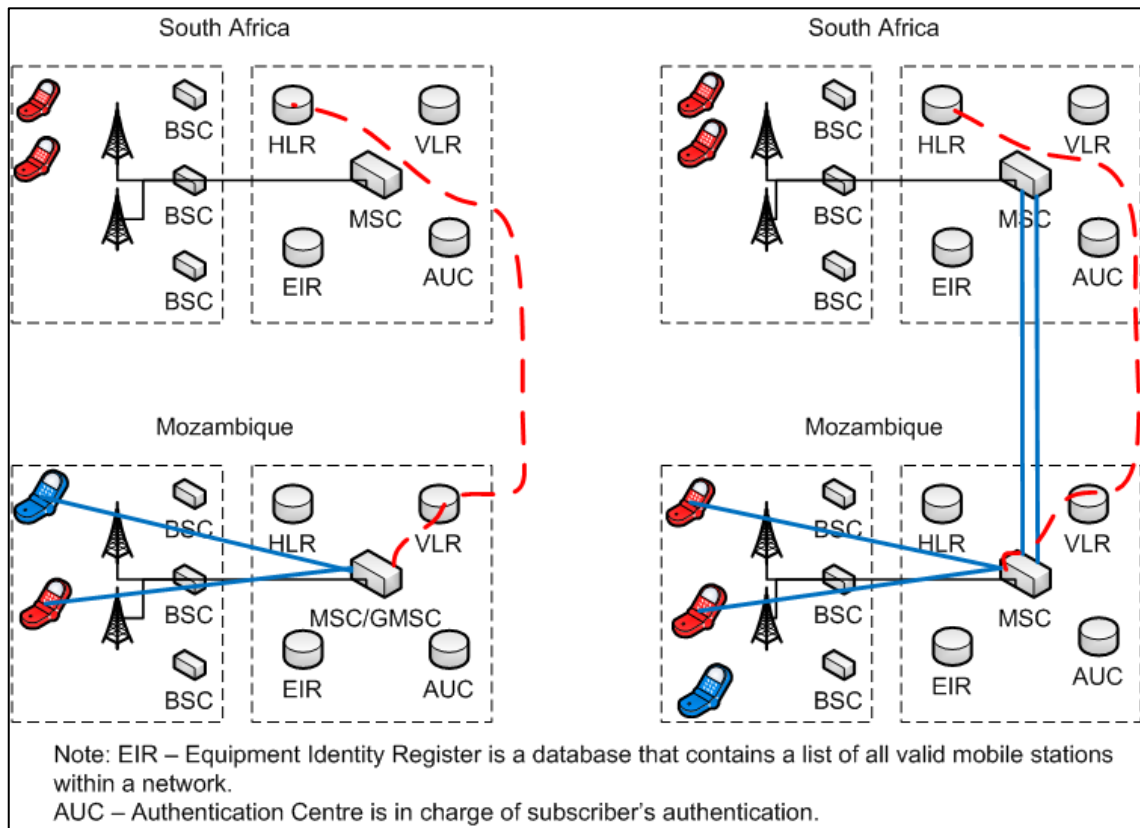
Box 1: Technical explanation of international mobile roaming between two GSM networks

In a GSM network, a call originated at a mobile device through the Base Station Subsystem (BSC) goes to a Mobile Switching Centre (MSC). The MSC contacts the Visiting Location Register (VLR). The precondition for registration by the VLR is that there is a roaming agreement between the visiting network and the user's home network. The VLR sends the location information of the mobile station to the subscriber's Home Location Register (HLR). In this way the HLR is always updated with regard to location information of subscribers registered in the network. The information sent to the HLR on GSM networks is normally the Signalling System 7 (SS7) address of the new VLR, although it may be a routing number. The MSC routes the call to a Gateway Mobile Switching Centre (GMSC). The GMSC interrogates the called subscriber's Home Location Register (HLR) for a Mobile Station Roaming Number (MSRN), then uses the obtained MSRN to route the call to the correct MSC in which the called subscriber is present. The call then goes through the BSC to reach the destination device.

There are always signalling communications between the visited and home operator when roaming, even when the call is routed inside a visited country. Two examples are illustrated below. The diagram on the left shows a subscriber of a South African operator travelling to Mozambique and calling a Mozambican operator's subscriber. The diagram on the right shows a subscriber of a South African operator travelling to Mozambique and calling another subscriber of the same South African operator, who is also currently visiting Mozambique. The dashed red lines indicate signalling channels, and blue lines indicate voice channels.

Source: Adapted from ITU, 2008, pg. 5, Box 1

Figure 2: Technical explanation of international mobile roaming between two GSM networks



Source: Adapted from ITU, 2008, pg. 5, Box 1; and Falch *et al.*, 2009, pg. 21, Fig. 1

2.2.2. Cost components in International mobile roaming

Jervelund, Karlsen and Olesen (2007) estimated that wholesale roaming costs comprise several elements, some or all of which apply to individual roaming calls. These elements are:

- Mobile origination (MO) – signal from mobile phone to the network;
- Mobile termination (MT) – signal to the receiver of a phone call on a mobile network;
- Fixed termination (FT) - signal to the receiver of a phone call on a fixed network;
- International transit (IT) – traffic between networks in different countries; and
- Roaming specific costs (RSC) such as billing and signalling.

Table 2 shows the estimated cost of each roaming element for European Union (EU) operators (Jervelund *et al.*, 2007). Mobile origination and termination are approximately equal and comprise the highest cost at approximately 12.3 Euro cents each. Fixed termination (1.00 Euro cents), international transit (2.00 Euro cents) and roaming specific costs (2.00 Euro cents) are all very small compared to the mobile origination and termination costs (ITU, 2008).

Table 2: Estimate of international mobile roaming costs in the EU

	Cost element	Cost per minute, Euro cents
Wholesale cost	Mobile origination	12.34
	Mobile termination	12.34
	Fixed termination	1.00
	International transit	2.00
	Roaming specific costs	2.00

Source: Adapted from Jervelund *et al.*, 2007, pg. 24, Table 3.10

Falch *et al.* (2009) obtained similar figures for these roaming cost elements as seen in Table 3.

Table 3: Cost estimates of key network functions in international mobile roaming

Cost element	Cost per minute, Euro cents
Mobile origination (MO) / mobile termination (MT)	10.00
Fixed termination (FT)	1.20
International transit (IT)	2.00
Roaming specific costs (RSC)	2.00

Source: Adapted from Falch *et al.*, 2009, pg. 24

2.2.3. Call scenarios and tariffs in international mobile roaming

Appendix 3 shows the four call scenarios in international mobile roaming. ITU (2008) and columns three and four of appendix 3, which compare the cost structures of a roaming subscriber relative to a local subscriber, show that in all

call scenarios the only difference is the additional roaming specific costs for the roaming subscriber. From Table 2 and Table 3 we see that this roaming specific cost is approximately two Euro cents (€0.02) per minute, which equates to USD 0.028 (using exchange rate of €1 = USD1.40160 on 21/10/2010 from <http://www.x-rates.com/calculator.html>).

Table 4 presents an overview of international mobile roaming retail tariffs within the SADC region. The tariff for a voice call back home varies between USD 0.37 and USD 6.73 per minute, while the data usage tariff varies between USD 0.37 and USD 69.34 per Mega Byte (Analysis Mason, 2010). Analysis Mason (2010) estimated that in 2010 the average tariff for a SADC roamer to call home was USD 1.90 per minute.

Table 4: Retail roaming tariffs within SADC

International mobile roaming activity	Tariff
Local call (USD/min)	0.11 - 1.98
Call home (USD/min)	0.37 – 6.73
Received call (USD/min)	0.30 – 2.12
Send local SMS (USD)	0.07 – 0.94
Send SMS home (USD)	0.14 – 0.94
Data sent (USD/1MB)	0.37 – 69.34
Data received (USD/1MB)	1.73 – 69.34

Source: Analysis Mason, 2010, pg. 68

2.3. Cross border travel and IMR patterns in SADC

In 2009 Africa had a population of 1 billion people and 442 million mobile subscribers (ITU, 2010b), as shown in Table 5. The ITU (2010b) demonstrated that this region had the lowest mobile penetration (43.8%) in the world, and fared particularly badly compared to Europe (121.6%), North America (92.3%), Latin America and the Caribbean (89%) and the Middle East (79.4%). Mobile

penetration is defined by ITU (2010b) as the number of mobile subscriptions per 100 people, as shown in equation 1.

$$\text{Mobile penetration, \%} = \frac{\text{Number of mobile subscriptions}}{\text{Population}} \times 100 \quad (1)$$

Table 5 and Informa (2008) showed that in 2009 Africa had the lowest number of outbound roamers (5.6 million) of any region in the world, which was far less than Europe (190.1m), Asia Pacific (85.6m), Latin America and the Caribbean (56.5m) and North America (49.2m).

Table 5: World population and mobile statistics by region, 2009

Region	Population	Mobile subscribers	Mobile penetration, %	Outbound roamers, m
Africa	1,008,354,109	441,897,602	43.8	5.60
North America	348,297,000	321,570,000	92.3	49.16
Middle East	211,174,911	167,581,482	79.4	27.65
Asia Pacific	3,792,004,000	2,121,774,000	56.0	85.57
Europe	884,005,000	1,075,360,000	121.6	190.11
Latin America & Caribbean	581,468,000	517,466,000	89.0	56.49
World	6,825,303,020	4,645,649,084	68.1	414.58
SADC	270,268,752	109,439,000	40.5	3.10
North Africa	167,443,089	128,279,518	76.6	
Sub-Sahara Africa	840,911,000	313,618,000	37.3	

Source: ITU, 2010b; and Informa, 2008

Versi (2007) explained that the bane of the African businessperson is a lack of cross-border roaming services. This is a pity since there is high human traffic among African countries due to trade, social relations and common languages (Gillwald & Mureithi, 2010). Some languages which are spoken in more than one SADC country are shown in Table 6.

Table 6: Common languages in SADC

Language	Countries
English	All SADC countries except Angola, DRC and Mozambique
French	DRC, Madagascar, Mauritius
Portuguese	Angola, Mozambique
Swahili	DRC, Tanzania
Setswana	Botswana, South Africa
Sesotho	Lesotho, South Africa
Tsonga (Shangaan)	Mozambique, South Africa
Kikongo	Angola, DRC
Zulu	Lesotho, South Africa
Xhosa	Lesotho, South Africa
Ndebele	Zimbabwe, South Africa
SiSwati	Swaziland, South Africa
Afrikaans	Namibia, South Africa

Source: CIA, 2010

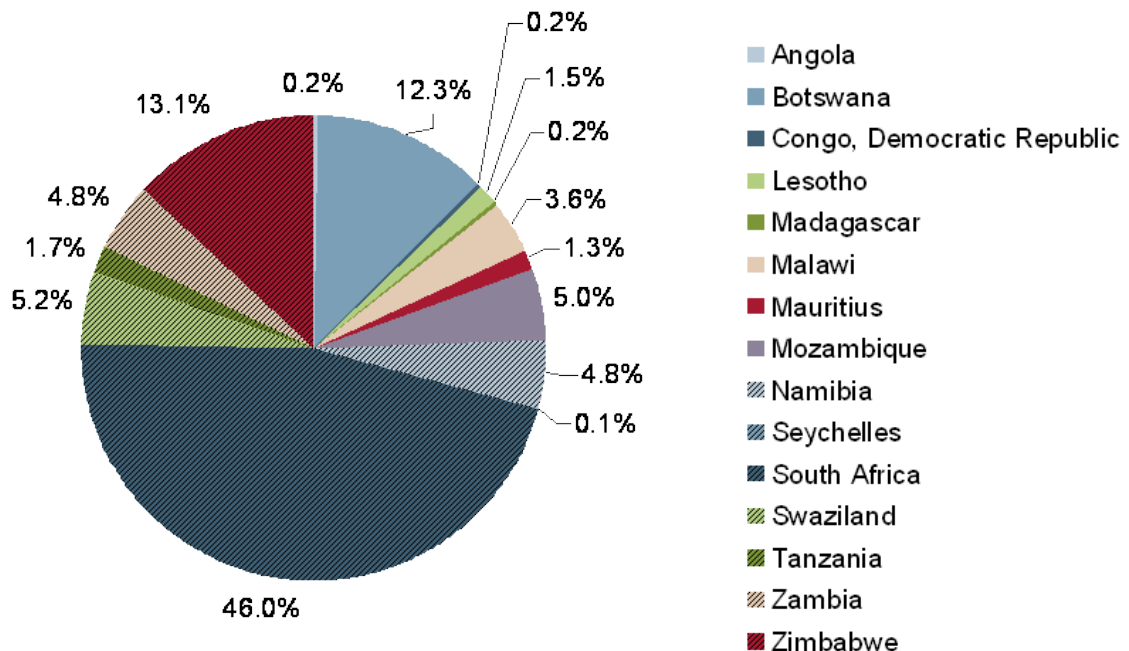
McCormick (2003) highlighted that South Africa is very important to SADC since its economy was three times the combined size of all the other SADC economies in 1993. The drive for regional integration within the SADC region means that there are high levels of trade and travel between South Africa and its neighbours (McCormick, 2003). Analysis Mason (2010) argued that in 2009 there were 16.5 million tourist arrivals from African countries to the SADC region, with South Africa receiving almost half of these African tourists (46% or 7.6m) (Figure 3). The United Nations World Tourism Organisation (UNWTO, 2010) agreed that South Africa received the most visitors among African countries in 2009. Zimbabwe (13.1%) and Botswana (12.3%) also received large numbers of visitors (Figure 3).

Statistics South Africa (2010) showed that 75.6% (7.6 million) of the 10.1 million foreign visitors to South Africa in 2009 came from the SADC region, 1.8% (177

thousand) from other African countries and 21.6% (2.2 million) from overseas countries (Table 7).

Informa (2008) estimated that there were 5.6 million outbound roamers from Africa in 2009 (Table 5), while Analysys Mason (2010) estimated that 3.1 million of these roamed within the SADC region. Considering that in 2009 the average cellular mobile penetration in the African region was 43.8% (ITU, 2010b), one would have expected that the number of outbound roamers from Africa to the SADC region would be close to 7.2 million people (43.8% of 16.45m visitors). Additionally, South Africa alone should have received close to 3.1 million roamers if we multiply the number of visitors from SADC to South Africa and the mobile penetration of SADC countries (40.5% of 7.6m visitors) (columns 4 and 5 of Table 8).

Figure 3: Percentage of tourist arrivals from Africa to the SADC countries, 2009



Source: Analysys Mason, 2010, pg. 35, Fig. 4.1

Table 7: Origin of foreign visitors to South Africa in 2009

Region	Visitors to South Africa in 2009	%
SADC	7,638,678	75.6
Other Africa	177,257	1.8
Overseas	2,179,879	21.6
Unspecified origin	102,492	1.0
Total	10,098,306	100.0

Source: Statistics South Africa, 2010

The 3.1 million roamers in the SADC region (Analysys Mason, 2010) suggested that 2.8% of the region's subscribers roamed to another country in 2009, which is low compared to other regions of the world (Informa, 2008) where 33.1% of European, 20% of North American and 17.2% of Latin American mobile subscribers roam internationally as shown in Table 9.

Table 8: SADC population, mobile and travel statistics, 2009

Country	Population in 2009	Mobile subscribers, 2009	Mobile penetration, %	Visitors to South Africa	Tourists to South Africa
Angola	18,497,632	8,109,421	43.8	40,306	37,254
Botswana	1,949,780	1,874,101	96.1	838,931	484,258
Congo (Democratic Republic of the)	66,020,364	10,163,391	15.4	32,972	30,982
Lesotho	2,066,919	661,000	32.0	2,100,366	1,048,550
Madagascar	19,625,030	5,997,436	30.6	2,993	2,623
Malawi	15,263,417	2,400,000	15.7	153,280	139,605
Mauritius	1,288,219	1,086,748	84.4	16,073	13,625
Mozambique	22,894,294	5,970,781	26.1	1,363,178	983,739
Namibia	2,171,137	1,217,000	56.1	217,476	177,863
South Africa	50,109,820	46,436,000	92.7		
Swaziland	1,184,936	656,000	55.4	1,090,559	628,113
Tanzania	43,739,052	17,469,486	39.9	16,973	14,732
Zambia	12,935,368	4,406,682	34.1	165,776	147,089
Zimbabwe	12,522,784	2,991,000	23.9	1,599,795	1,227,631
Total	270,268,752	109,439,046	40.5	7,638,678	4,936,064

Source: ITU, 2010b; and Statistics South Africa, 2010

Table 9: Global mobile roamers as a percentage of total subscribers, by region

Roamers as % of total subs	2008	2009	2010	2011	2012	2013
North America	18.0	20.0	22.0	23.8	25.5	27.0
Latin America	16.3	17.2	18.4	19.9	21.7	23.8
Asia Pacific	5.5	5.8	6.2	6.7	7.1	7.6
Europe	31.3	33.1	35.1	37.0	38.7	40.2
Africa/Middle East	7.0	8.0	9.2	10.6	12.0	13.3
Globe Total	13.0	13.6	14.4	15.4	16.3	17.3

Source: Informa, 2008, pg. 23, Fig. 2.12

Table 9 shows that approximately 8% (33.25 million) of the total African and Middle East mobile subscribers roam internationally at least once a year (Informa, 2008). Closer examination shows that the majority of roamers from this sub-region were from the Middle East and only 5.6 million Africans roamed internationally in 2009 (Informa, 2008), resulting in a roaming rate of 1.8% for African subscribers.

The low roaming uptake by African visitors to the SADC region suggests that they are using alternative calling mechanisms such as switching to local SIM cards (plastic roaming) in the destination country (ITU, 2008) or switching their phones off and not roaming. This low international roaming activity can be directly linked to the high IMR tariffs, which averaged \$3.05 per minute for an African roamer to call home (Informa, 2008). Since approximately 80% of calls by outbound roamers go to the home country (CEC, 2006), this suggests that intra-African roaming calls are charged close to this average tariff and are therefore expensive.

OECD (2010) argued that a drop in retail roaming tariffs will be offset by an increase in the volume of calls. This argument is supported by GSMA (2008a)

which highlights the positive effect that competition had on lowering retail international mobile roaming tariffs in the three East African countries of Kenya, Tanzania and Uganda, and the associated seven fold increase in roaming traffic experienced by MTN Uganda as a result of the lower tariff. This suggests that mobile operators in the SADC region have an opportunity to stimulate usage and increase profits from IMR by reducing the retail roaming tariff.

2.4. Welfare impact

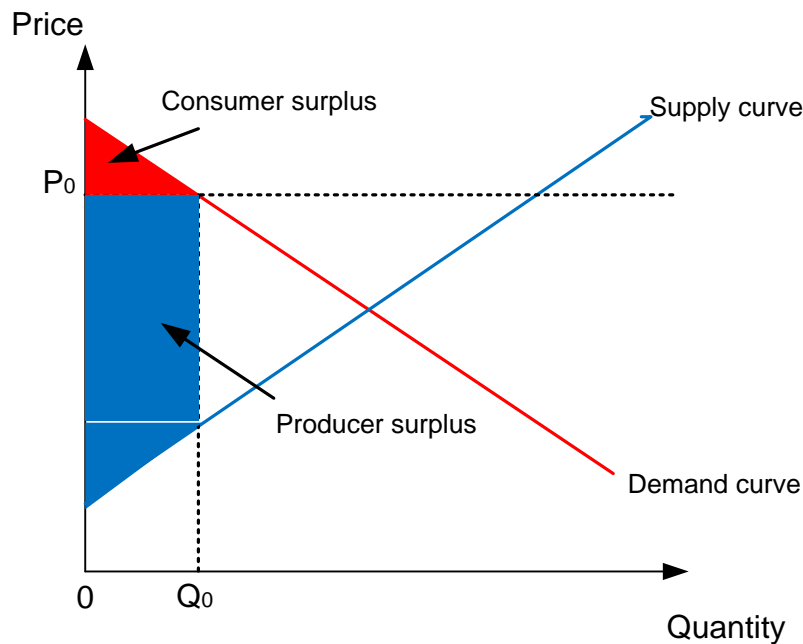
Social welfare was described by the Commission of the European Communities (CEC, 2008) as the sum of changes in consumer welfare and industry profits. This section examines the literature on these two components of social welfare.

OECD (2007) described consumer welfare as individual benefits derived from the consumption of goods and services. It further explained that consumer welfare is difficult to measure due to a lack of information about individual consumer preferences. Measurement of consumer surplus only requires knowledge of the demand curve, which is readily available; hence it is widely used as a measure of consumer welfare (OECD, 2007; Hee Lee & Hee Lee, 2006). OECD (2007) further argued that consumer surplus should be maximised while ensuring that producers also benefit through increased profits.

OECD (2007), Forge, Blackman and Bohlin (2008), and Baye (2009) defined consumer surplus as the excess value or difference between what a consumer is willing to pay and the actual price paid for a good or service. OECD (2007) argued that by charging a high tariff for international mobile roaming, mobile

network operators (producers) receive a high surplus (profits) but limit consumer demand. This view is in line with classic economic theory as demonstrated in Figure 4, which shows that the quantity demanded (Q_0) is low when the price or tariff (P_0) is high.

Figure 4: High price results in low demand

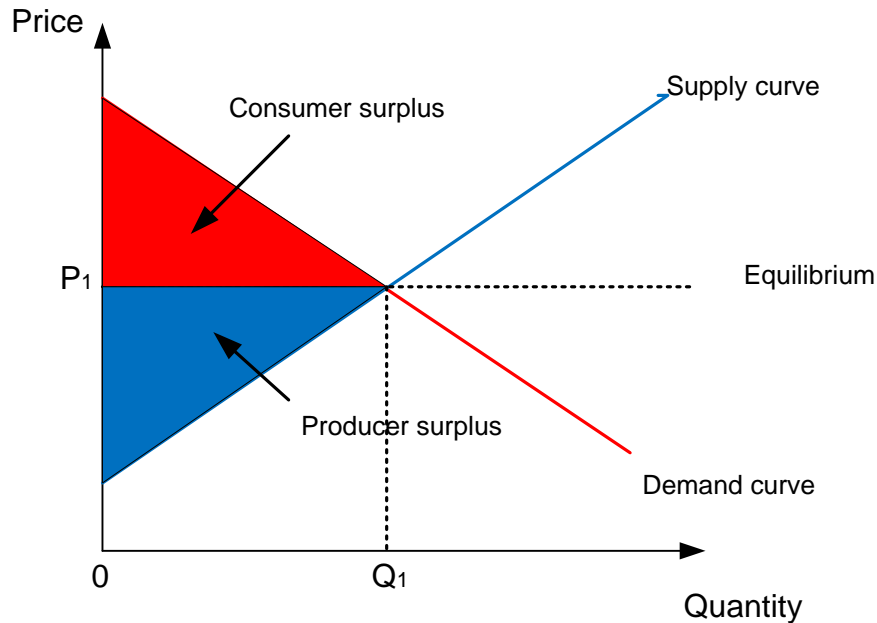


Source: Baye (2009)

Baye (2009) showed that when the demand for a good or service is elastic, companies can increase revenue by decreasing the price charged to consumers. Mobile network operators (MNOs) have traditionally targeted business users with inelastic demand as shown in Figure 4, while ignoring those with elastic demand who balk at paying high roaming tariffs (OECD, 2009). In order to maximise consumer surplus and increase revenue MNOs need to reduce roaming tariffs within the region of elastic demand (Baye, 2009). This suggests that MNOs should stimulate roaming usage among the prepaid consumer segment, which comprises approximately 88% of all mobile

subscribers in the African region (Informa, 2008). ITU (2008) argued that the consumer segment of mobile users is price sensitive, hence their reluctance to engage in international mobile roaming at the current high tariffs.

Figure 5: Reduced IMR price leads to higher consumer surplus

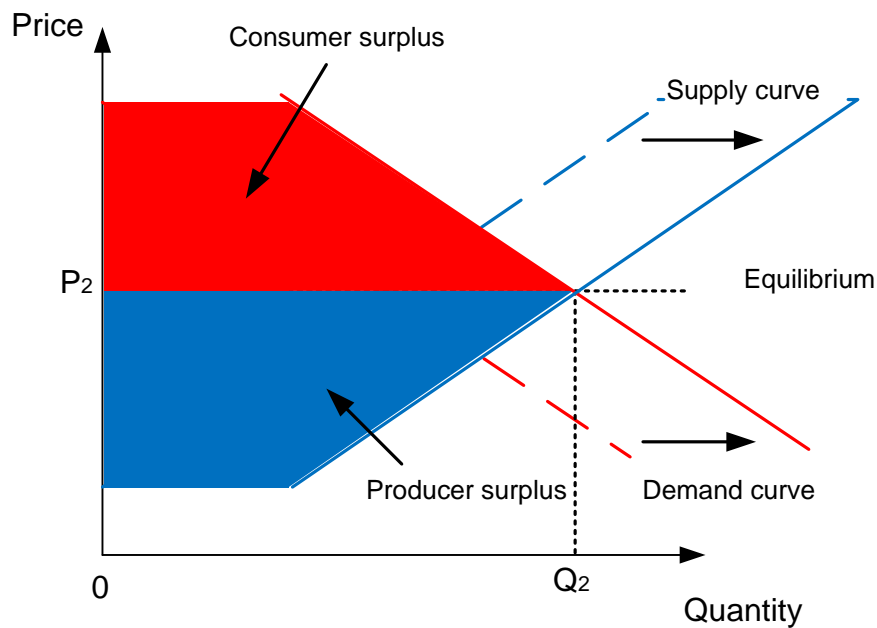


Source: Baye (2009)

The Commission of the European Communities (CEC, 2008) suggested that both consumer surplus and operator profits will increase as a result of the reduction in wholesale and retail tariffs in Europe due to the increased usage and higher retail mark-up. This view is supported by classic economic theory (Baye, 2009) as shown in Figure 5, which demonstrates that consumers receive a larger surplus when the tariff drops from P_0 to P_1 .

CEC (2008) argued that producer profits will fall slightly when the lower tariff is initially introduced, but will increase over time as the demand is stimulated as shown in Figure 6.

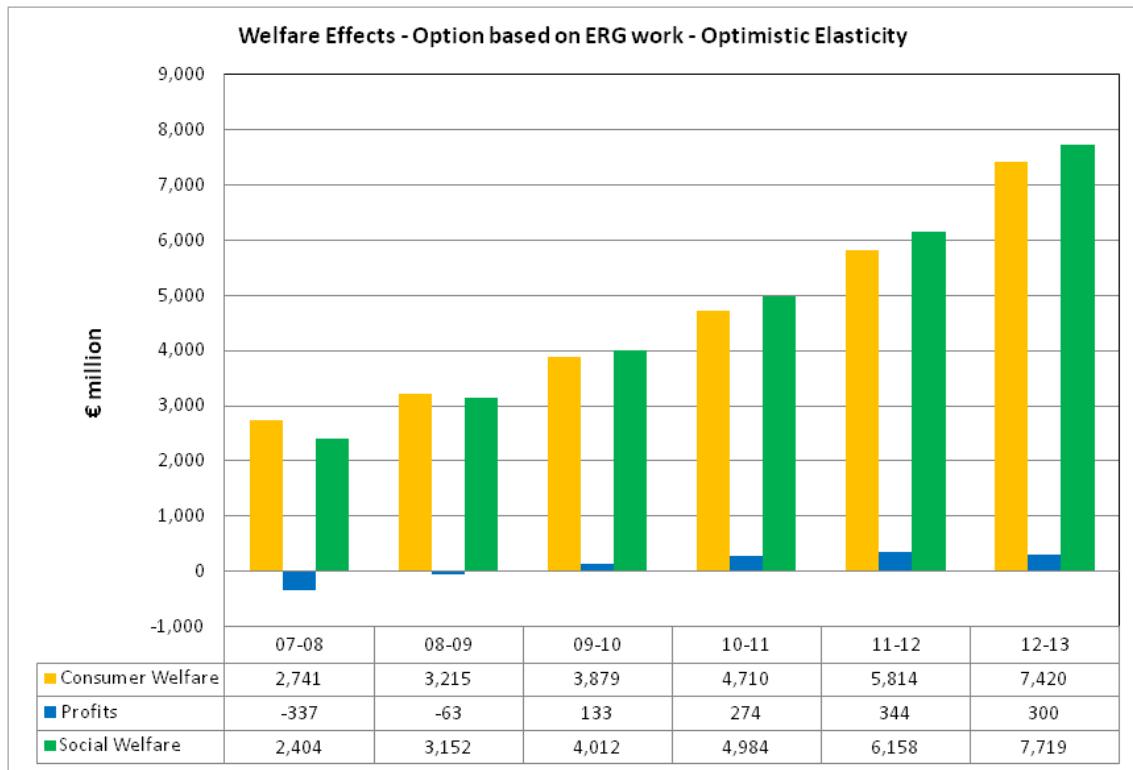
Figure 6: Increased demand due to lower tariff



Source: Baye (2009)

Figure 7 shows that social welfare, the sum of consumer surplus and profits, will increase over time as both components increase. CEC (2008) estimated that in 2007/08, the first year of the European Union (EU) roaming regulation, consumer welfare increased by €2.7 billion while operator profits from international mobile roaming (IMR) fell by €337 million – resulting in increased social welfare of €2.4 billion. Projections up to the years 2012/13 show that operator profits will increase over time as increased volumes offset the lower tariffs, resulting in ever increasing social welfare (CEC, 2008). Figure 7 shows that social welfare from the EU roaming regulation will increase from €2.4 billion in 2007/08 to €7.7 billion in 2012/13.

Figure 7: Welfare effects of optimistic elasticity of IMR



Source: CEC, 2008

2.5. Reasons for high IMR retail tariffs

2.5.1. Inter-operator tariff (IOT) – the root of the problem

OECD (2009) argued that the wholesale rate or inter-operator tariff (IOT) charged by the visited or foreign mobile network operator (MNO) has the greatest impact on retail roaming tariffs since it can be as much as 75% of this tariff. Informa (2008) and Salsas and Koboldt (2004) explained that the majority of an operator’s roaming revenue is due to profit made from IOTs, hence attracting visitors to a network is more lucrative than sending them abroad.

History of IOT

Sutherland (2001 & 2008), and Salsas and Koboldt (2004) explained that up to 1998 charges in the wholesale market were based on the Normal Network Tariffs (NNT) charged by MNOs – in essence the same tariffs as for domestic calls with a mark-up (capped at 15%) to account for the lack of subscription revenues from roaming mobile phone users. Under the NNT regime, competitive pressure on call prices for domestic users directly translated into lower roaming charges (Salsas & Koboldt, 2004). However, NNTs increased over time as operators chose the highest call tariffs as reference points, switching from business to residential tariffs (Sutherland, 2008; Salsas & Koboldt, 2004).

In 1998, the NNT regime was replaced by MNOs setting specific Inter-Operator Tariffs (IOT) which are decoupled from domestic call charges (Sutherland, 2008). Home operators then mark up the visited network's IOT in order to arrive at a retail tariff for roaming services (Sutherland, 2008; Salsas & Koboldt, 2004). All operators in a given country usually apply the same or very similar retail mark-ups (Salsas & Koboldt, 2004).

2.5.2. Demand elasticity of consumer and business travellers

Informa (2008) explained that there are two types of roaming subscribers – business and consumer cross border travellers. Worldwide the vast majority of roamers – outside the tourist season – are business travellers (Informa, 2008). These business travellers generally display inelastic demand for international mobile roaming (IMR), while the consumer or tourist travellers are very price sensitive (Informa, 2008). Informa (2010) supported this view by stating that

business travellers, whose usage of international mobile roaming is paid for by their companies, are likely to have more inelastic pricing demand.

Analysis Mason (2010) explained that in SADC most consumer or tourist travellers do not use IMR due to the high tariffs. Analysis Mason (2010) and Informa (2008) further explained that in Africa the majority of cross border roamers are consumers. This finding is not surprising since in Q1, 2010 there were only 17.8 million mobile cellular post paid contracts out of a total 488 million subscribers in Africa, which means that 96% of all mobile cellular connections in Africa were on prepaid (consumer) packages (Wireless Intelligence, 2010; ITU 2010b). Sutherland (2010a) also identified high spending African business leaders and government ministers as heavy users of international mobile roaming.

2.5.3. Comparison with accounting rates

Falch *et al.* (2009) argued that IOTs are reminiscent of international accounting rates in the fixed telephone networks, which kept international telephone charges artificially high for many years. Wallsten (2001, pg. 307) described accounting rates as *“bilaterally negotiated symmetric prices carriers pay to each other to terminate international telephone calls in the other country – that are almost universally believed to be above cost”*.

Just as with the fixed networks and international accounting rates, the home and foreign mobile network operators have a common interest in keeping the IOT at a high level since they both benefit at the expense of the customer (Falch *et al.*, 2009). Collins (2000) argued that the marketplace was ineffective in lowering retail tariffs of international telephone calls due to competitive

carriers lacking the leverage to bargain for cost based rates and monopoly carriers lacking an incentive to forego the high revenues from the accounting rate system, which sounds very similar to the current debate on IOTs.

Wallsten (2001) further explained that in 1997 the United States Federal Communications Commission (FCC) unilaterally ordered sharp reductions in the accounting rates applicable to US telephone carriers and effectively reduced the rate worldwide due to the large amount of telephone traffic sent from the US to other countries. Falch *et al.* (2009), and Wallsten (2001) argued that the accounting rate reduction, coupled with increased retail competition in international calls, resulted in a dramatic drop in retail tariffs and stimulated usage of international telephony.

2.6. Alternatives to international mobile roaming

Sutherland (2001) stated that in order to reduce costs, some companies encouraged their staff to make use of phone cards and to visit their local offices as alternatives to international mobile roaming (IMR). Analysis Mason (2010) and Sutherland (2010a) argued that the vast majority of African, including SADC, cross border travellers do not roam and instead use inexpensive alternatives to international mobile roaming (IMR). Some of the alternatives to IMR that are used by SADC cross border travellers are - purchase of a local SIM card and engage in “plastic roaming” (Analysis Mason, 2010; Sutherland, 2010a); use of calling cards to make international calls back home; use of the Internet to make voice over internet protocol calls e.g. via Skype; and other internet based communications (Analysis Mason, 2010).

(ITU, 2008, pg. 11) stated that it is difficult to use a local SIM card since –

- Some operators lock the handsets they provide so that it can only work with a SIM from their network
- Customers will temporarily lose the use of their home number – which is one of the primary reasons for the success of IMR.
- Customers may not have sufficient information about the best deals from local operators
- The SIM card may get lost or disconnected from the network, especially if it is not used frequently.

In addition to the above, customer registration (RICA) legislation, which is being introduced in several African countries (Analysis Mason, 2010), requires subscribers to provide proof of identity and physical address in the country of the SIM provider. These challenges have prompted ITU (2008) to declare that there is no viable alternative to international mobile roaming. This view is supported by OECD (2010) which stated that the alternatives to mobile roaming are not consumer friendly and suffer from low uptake.

2.7. Technical and commercial advances in roaming

OECD (2009) argued that several technological and commercial advances such as traffic steering, as well as internalisation and localisation of traffic have the potential to place downward pressure on wholesale tariffs and may reduce the influence of the IOT system over time.

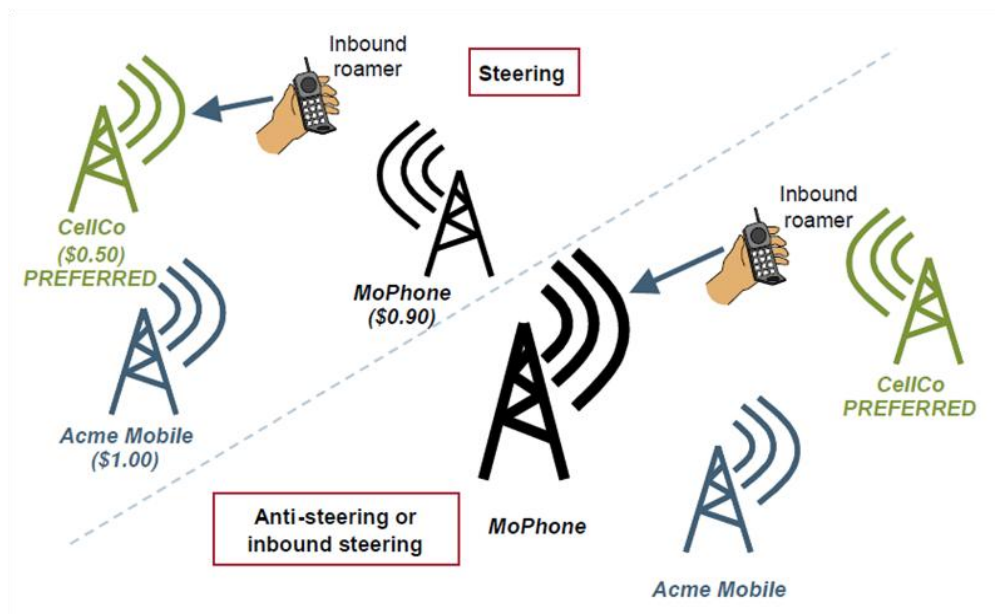
2.7.1. Traffic steering

OECD (2009) reported that from 2003 onwards traffic steering techniques improved to the point that the home MNO could direct its outbound roamers to the preferred roaming partner in each country, in order to benefit from lower

wholesale tariffs offered by that roaming partner. Further, Analysis Mason (2010) and ITU (2008) argued that most home MNOs can now successfully steer more than 80% of their outbound roamers unto the network of their preferred roaming partner. This development has enabled the home MNO to negotiate better wholesale tariffs since it can guarantee increased roaming traffic to the preferred roaming partner (OECD, 2009).

Analysis Mason (2010) explained that MNOs employ traffic steering to lower their roaming costs as seen in Figure 8. Despite objections from the GSM Association, some networks (which have high wholesale tariffs) in the visited country employ anti-steering in order to boost their revenues from inbound roaming as shown in Figure 8 (Analysis Mason, 2010).

Figure 8: Traffic steering example



Source: Analysis Mason, 2010, pg. 28

Despite the reduction in wholesale tariffs made possible by advances in traffic steering, ITU (2008) found that these savings were rarely passed on to consumers in the form of retail tariff reductions.

2.7.2. Internalisation of traffic

Sutherland (2010a) and ITU (2008) explained that advances in the effectiveness of traffic steering techniques have encouraged mobile operators to form large groups or roaming alliances in order to keep roaming traffic within the group. The Zain One Network is an example of internalisation where the reduction or elimination of wholesale tariffs, due to traffic being kept within the group, has been passed on to subscribers through the removal of roaming surcharges (Sutherland, 2010a; ITU, 2008 and OECD, 2009).

Vodafone Passport and MTN One World are two examples of vastly reduced retail tariffs as a result of internalising roaming traffic within a group of mobile operators with common ownership (ITU, 2008; Sutherland, 2010a). MTN's One World is also a competitive response to the Zain One Network since these two groups each operate in more than 15 African countries, many of which overlap (Sutherland, 2010a; Gillwald & Mureithi, 2010).

2.7.3. Localisation

Localisation allows a foreign network operator or global mobile virtual network operator (MVNO) to be treated as a local MVNO, thereby obtaining local wholesale tariffs rather than the high roaming tariffs (OECD, 2009). This practice requires the cooperation of local MNOs or MVNOs to facilitate access

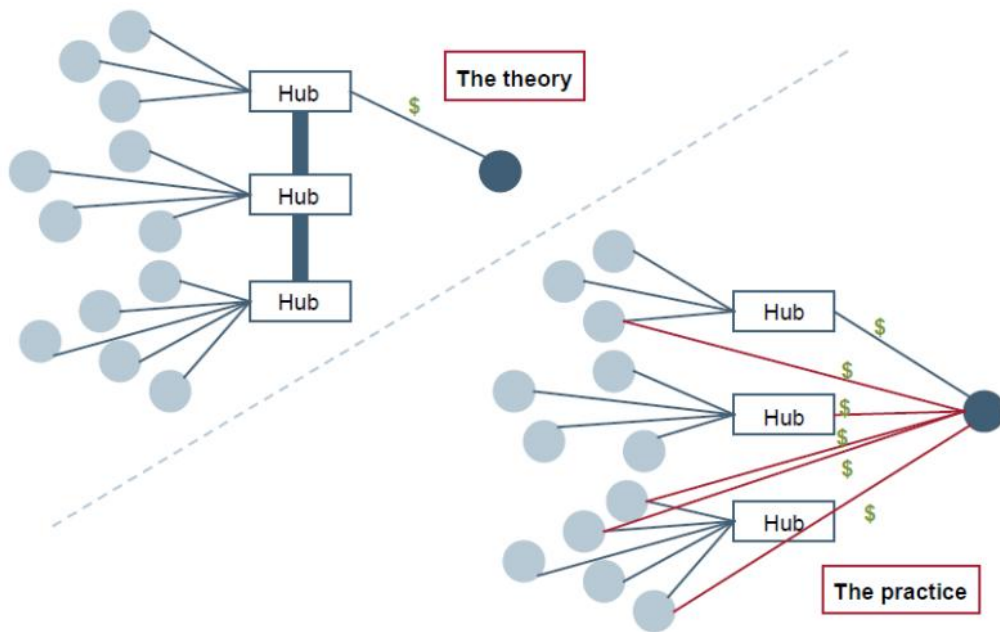
to networks in different countries on local terms for global MVNOs (OECD, 2009; ITU, 2008).

OECD (2009) described a MVNO as a mobile service provider that leases network capacity from a mobile network operator. Global MVNOs thus become local in every country in which they have an agreement, vastly reducing their wholesale costs (OECD, 2009). The global MVNO will therefore be able to provide international mobile roaming in many countries at retail tariffs similar to the tariff charged by the local operator for a similar call (OECD, 2009; ITU, 2008).

2.7.4. Roaming hubbing

In order to minimise the effort required to manage multiple roaming agreements and to reduce the time required to negotiate new agreements and the associated testing, MNOs have increasingly turned towards roaming hubs (Analysis Mason, 2010). Informa (2010) is however not convinced of the benefits of roaming hubs, since MNOs are forced to maintain some bilateral roaming agreements due to the various hubs not being interconnected as seen in Figure 9.

Figure 9: Roaming hubs theory and practice



Source: Analysis Mason (2010), pg. 27

2.7.5. Dual SIM handsets

ITU (2008) explained that although handsets exist which can take two SIM cards at the same time, they are not widespread due to the reluctance of MNOs to share their customers with other operators. Another disadvantage is that only one SIM can be active at a time and switching to the other SIM requires the handset to be switched off and back on (ITU, 2008).

2.7.6. Multiple numbers on single SIM

MNOs in a visited country are now able to target inbound roamers and provide them with a local number using the home SIM card, even though no roaming agreement exists with the roamers home MNO (ITU, 2008). ITU (2008) gave the example of Saudi Telecom which provides a local Saudi Arabian number to incoming visitors and provides them with a prepaid “Al Jawal” service.

2.8. Regulatory reform

ITU (2010a and 2009) and Gillwald (2005) stated that good regulatory reform has three elements – privatisation, competition and a separate regulator. Gillwald (2005) further argued that South Africa’s regulatory reform of the telecommunications sector initially focused on privatisation of the fixed line incumbent Telkom, at the expense of increasing competition and effective regulation, hence its failure. According to Gillwald (2005) and ITU (2010a), the success of regulatory reform requires that all three elements receive sufficient attention.

SADC countries have committed themselves to regulatory reform through the SADC Protocol on Transport, Communications and Meteorology which was adopted in 1996 (McCormick, 2003). McCormick (2003) further explained that implementation of this protocol is led by Mozambique and entails, amongst others, enhanced interconnectivity of telecommunications networks within the region and globally, private sector investment in the sector, introduction of competition and establishment of independent regulators in each country.

Almost half of the countries in Africa have privatised their incumbent fixed line telecommunication operator, while most have licensed at least two mobile operators (ITU, 2010c), thereby addressing two of the three elements of regulatory reform that were mentioned by Gillwald (2005) and ITU (2010a). Additionally, ITU (2010a) showed that 39 of the 53 countries in Africa possess an independent communications regulator, which is the third element of regulatory reform.

Of the fifteen SADC countries only Swaziland does not have an independent communications regulator and has not introduced competition in the mobile sector (ITU, 2010b). It has also not privatised its incumbent fixed line operator, but is not alone in this respect since many SADC countries have also failed to do so (ITU, 2010b), thereby failing to comply with the requirements of the SADC Protocol on Transport, Communications and Meteorology.

Sutherland (2010a) argued that regulation of the communications sector in Africa has focused on domestic services and tariffs, while ignoring international mobile roaming.

2.8.1. Need for regulation

Andres, Guasch and Straub (2007) explained that the aim of regulation is to protect consumers from the abuses of service providers and, just as importantly, to protect investors from opportunistic behaviour by government. Interestingly, the ITU (2010a) warned that national regulatory authorities (NRAs) should balance consumer benefits against costs when considering regulatory intervention.

Sutherland (2010a) suggested that commercial approaches have reduced IMR tariffs in Africa thereby reducing the need for regulatory intervention. The Ministers responsible for Information and Communication Technologies in the SADC region hold a different view and instructed their respective communications regulators to take appropriate action to reduce the high roaming tariffs in the region (CRASA, 2010). CRASA is an abbreviation for Communications Regulators Association of Southern Africa, an association of

Information and Communication Technologies (ICT) regulators and other stakeholders in Southern Africa (CRASA, 2010).

Table 10 shows some reasons why various stakeholders want international mobile roaming (IMR) to be regulated. Consumers are concerned about the lack of choice, high tariffs and the lack of transparency around IMR; some mobile operators are concerned about their poor image due to bill shock and high tariffs as well as a search for new revenue streams to offset saturated domestic markets; while governments and regulators are concerned about consumer protection (Analysis Mason, 2010).

Table 10: Some reasons why stakeholders want regulation of IMR

Consumers	Mobile Operators	Governments/Regulators
<ul style="list-style-type: none"> No choice on selecting roaming service provider 	<ul style="list-style-type: none"> Poor image – complaints from consumers about abuse by operators 	<ul style="list-style-type: none"> Consumer complaints about operator abuse
<ul style="list-style-type: none"> High roaming tariffs 	<ul style="list-style-type: none"> Search for new revenue streams to offset saturated markets and flat growth 	<ul style="list-style-type: none"> No pass through of wholesale savings to consumers
<ul style="list-style-type: none"> No transparency 	<ul style="list-style-type: none"> High wholesale rates from foreign operators bear no link to cost 	<ul style="list-style-type: none"> Very high retail mark-up (sometimes > 200%)
<ul style="list-style-type: none"> Bill shock 	<ul style="list-style-type: none"> Lower tariffs will increase usage 	<ul style="list-style-type: none"> Protection of local subscribers
<ul style="list-style-type: none"> Some prepaid subscribers not allowed to roam 	<ul style="list-style-type: none"> Increase revenue and profits 	<ul style="list-style-type: none"> Protection of subscribers from other countries

Baye (2009) as well as Intven, Oliver and Sepulveda (2000) argued that competitive markets provide the greatest consumer welfare through market equilibrium where all goods produced are sold at the equilibrium price. Intven *et al.* (2000) and McAleese (2004) also argued that price regulation is justified when markets fail to produce competitive tariffs. Andres *et al.* (2007)

summarised the issue well by stating that regulation matters. The next step is to decide on the form of this regulation.

2.8.2. Self regulation

Self regulation by suppliers has generally been a failure since its sole aim is to prevent or delay regulatory intervention and not to deliver consumer benefit (ITU, 2008; Analysis Mason, 2010). ITU (2010a) found that regulation is required in the telecommunication sector since reliance on codes of practice, industry co-regulation and self-regulation are unlikely to meet the needs of connected consumers. This is because consumers do not always take an active interest in regulatory activities, while ICT providers may not share the same consumer and social protection agenda as the government (ITU, 2010a).

Sutherland (2010b) explained that the EU was forced to regulate energy efficiency and power consumption of consumer electronics since only few manufacturers adopted the voluntary codes of conduct. Additionally, the GSMA code of conduct which was designed to improve transparency of information provided to mobile customers failed dismally (Sutherland, 2008).

2.8.3. Wholesale only regulation

OECD (2009) found that wholesale roaming tariffs were likely to be above cost and hence need to be regulated. The Body of European Regulators for Electronic Communications (BEREC, 2010) argued that wholesale only regulation is likely to be ineffective since mobile operators have generally not passed on the full reductions in wholesale tariffs to their subscribers as

demonstrated by the increasing gap between regulated wholesale and unregulated retail roaming data tariffs in the European Union.

2.8.4. Retail only regulation

The Commission of the European Communities (CEC, 2006) explained that retail only regulation was appropriate where wholesale tariffs were low and retail mark-ups high, otherwise some smaller operators will be forced to provide roaming services below their wholesale cost. In the absence of these conditions, for example in the SADC region where MNOs claim that the IOT is high and that they apply a low retail mark-up of 10- 25 % (Analysis Mason, 2010), retail only regulation is inappropriate (CEC, 2006).

2.8.5. Wholesale and retail regulation

The European Parliament and Council (EC, 2007) found that international mobile roaming within the European Union was uncompetitive, resulting in excessive retail tariffs due to high wholesale charges levied by the foreign host network and high retail mark-ups charged by the subscriber's own network. Further, the cross-border nature of the service made it difficult for a national regulatory authority (NRA) to regulate the wholesale pricing behaviour of the foreign host network operator (EC, 2007). There was also some evidence that wholesale tariff reductions were not being passed on to consumers, hence the need to regulate both wholesale and retail tariffs across the European Union (CEC, 2006).

2.8.6. Competition

Khemani (2007) described competition as the process of rivalry between business enterprises for customers, while Van Gorp and Middleton (2010) argued that it is characterised by the presence of multiple players - which leads to innovation. Khemani (2007) as well as Van Gorp and Middleton (2010) further explained that innovation is characterised by declining prices and improved quality, along with expanding markets. ITU (2010a and 2009) agreed with this view and suggested that there is strong evidence that the degree of competition plays a large role in determining growth in an industry, with competitive markets outperforming non-competitive ones. ITU (2010a) further argued that competition in the Information and Communication Technology (ICT) sector played a major role in the sector's impressive growth over the last two decades. The combination of high growth, lower prices and increased quality led to increased economic efficiency and consumer welfare (Khemani, 2007).

In their response to the EU consultation on the regulation of roaming tariffs, mobile operators argued that no regulation was necessary since there was a high level of competition in the retail market (GSMA, 2008b). GSMA (2008a) supported this claim by highlighting the positive effect that competition had on lowering international mobile roaming tariffs in three East African countries and the associated seven fold increase in roaming traffic experienced by MTN Uganda as a result of the lower tariff.

Celtel's One Network (Versi, 2007) shows that commercial pressure due to a declining domestic market share in the various countries where it operated in

East Africa forced a mobile operator to introduce innovative cross border roaming solutions that were cost effective for consumers. Gillwald and Mureithi (2010) argued that disruptive competition, a variant of one of the three elements of regulatory reform, was the driver of this change in operator behaviour which yielded positive consumer benefits in East Africa.

What the mobile operators failed to mention was that this high level of competition existed in the domestic retail market and did not generally extend to the international mobile roaming market (OECD, 2009). Buhler (2009) explained that instead of encouraging competition among foreign mobile operators to drive wholesale roaming tariffs down, mobile operators form international roaming alliances which keep these wholesale roaming tariffs artificially high. OECD (2009 & 2010) further claimed that transnational mobile operators are likely to keep retail tariffs high in order to retain high revenues from price insensitive business travellers. Khemani (2007) went further and stated that when there is ineffective regulation and insufficient competition, the poor often suffer higher prices and receive lower-quality goods and services than the more affluent segments of society.

The main reason for this situation was that most domestic mobile markets were fully competitive with three or more operators, while consumers simply used their home mobile operator for international mobile roaming (OECD, 2009). This practice in effect restricted the choice of consumers with respect to their provider of international mobile roaming services, making their home mobile operator a monopoly for the provision of this service (OECD, 2009).

2.9. Some possible remedies

GSMA (2008a) highlighted the positive effect that competition had on reducing retail tariffs of IMR in East Africa, without regulatory intervention. Unfortunately, developments in Europe and other parts of the world have shown that mobile network operators have acted in their own interests to the detriment of consumers, if IMR is left unregulated (OECD, 2009; BEREC, 2010). ITU (2008) and OECD (2009) suggested that European mobile operators introduced lower international mobile roaming tariffs such as Vodafone Passport only in response to the threat of regulation. In the absence of competitive pressure to lower IMR retail tariffs, regulatory intervention needs to be considered (ITU, 2008).

OECD (2010) made several recommendations for developing countries to consider when regulating international mobile roaming. Some of these are –

- Countries should negotiate bilateral and multilateral agreements to lower wholesale tariffs.
- Countries should introduce temporary mobile number portability among home network operators to enable a roamer to use the international roaming services of any suitable home operator when s/he is abroad.
- Consumers should consider using alternatives to mobile roaming e.g. SMS, Internet/email, VoIP, hotel phones etc.

It will be difficult to implement many of these recommendations in the SADC region since South Africa is the only country that has introduced number portability (ITU, 2009), while the alternatives to mobile roaming are not consumer friendly and suffer from low uptake (OECD, 2010).

Closer to home, Analysis Mason (2010) made the following recommendations to CRASA for reducing the high cost of IMR in the SADC region, instead of tariff regulation:

- consumer education
- tariff transparency in the form of a welcome SMS containing the applicable roaming tariffs when a consumer enters a different country from his home network, and
- liberalisation of the few remaining monopoly international gateways in the SADC region

Consumer education

ITU (2009) agreed that regulators have a role to play in ensuring that consumers are aware of their rights and have the correct information to make rational choices. Analysis Mason (2010) however warned that consumer education initiatives are expensive and are unlikely to result in a reduction in retail roaming tariffs in the SADC region.

Transparency measures

Bone (2008) highlighted the importance of transparency as a precondition for consumer welfare. This was recognised by regulatory authorities in Europe (CEC, 2006) and SADC (Ministers, 2010) who decided to implement light touch regulation in the form of transparency measures before imposing tariff regulation. While their intention to provide consumers with relevant information to limit information deficiencies is laudable, Xavier (2008) cautioned that the emphasis should be on information quality rather than quantity. Xavier (2008) and Bone (2008) further argued that providing more information in an unstructured manner may cause information overload and result in worse decision making by consumers due to poor literacy of the recipient or unfriendly

format of the information. Efforts should therefore be made to test whether consumers find the proposed information useful, the format in which the information should be provided and who should provide it (Xavier, 2008).

Analysis Mason (2010) found that mobile subscribers and customer care staff of MNOs in SADC are largely unaware of the costs and conditions associated with IMR. Transparency measures are not guaranteed to reduce IMR retail tariffs, but they will help mobile subscribers to control their expenditure on roaming and help to prevent “bill shock” (Analysis Mason, 2010).

Liberalisation of the few remaining monopoly international gateways

Gillwald and Mureithi (2010) stressed the importance of liberalisation of international gateways through the example of Zain One Network. One Network was launched in East Africa only after the international gateway market was liberalised in all three countries (Tanzania, Kenya and Uganda), thereby allowing Zain to exchange traffic among its participating networks without having to use a third party and paying international transit fees (Gillwald & Mureithi, 2010). In contrast Zain Zambia did not participate in One Network until October 2010 (Computerworld Zambia, 2010), due to the continued monopoly of the incumbent operator over the international gateway in Zambia (Gillwald & Mureithi, 2010).

While liberalisation of the international gateway is a necessary condition for the reduction of IMR tariffs, it is not sufficient on its own (Gillwald & Mureithi, 2010). All countries in SADC, except Angola, have liberalised their international gateway market (ITU, 2010c) yet IMR tariffs remain high in most of these countries (Gillwald & Mureithi, 2010).

2.10. Roaming initiatives from around the world

Informa (2010) argued that while many regional groups are discussing if and how to regulate international mobile roaming, Europe is the only region in the world to have implemented regulation.

2.10.1. Asia Pacific

The Asia Pacific region had the second largest number of roamers in 2009 (93m) and was in the early stages of analysing whether to regulate international mobile roaming with two initiatives currently underway (Informa, 2010). Table 11 indicates that these two initiatives by the Association of Southeast Asian Nations (ASEAN) - comprising Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam; and the Asia Pacific Telecommunity (APT) – comprising Australia, New Zealand and most Asian countries, are following the pattern established by European tariff regulation and Middle East discussions (Informa, 2010).

Table 11: Regulatory initiatives on roaming in Asia Pacific

Initiative	Status	Region
ASEAN	Ongoing discussion to cut roaming tariff by 50%. The first conversations started in 2007/2008 but the different regulators were not able to get to a formal agreement.	Southeast Asian countries
APT	APT organised a workshop on international mobile roaming (IMR) from 8-10 June 2010 in Brisbane, Australia. The aim is to promote and assist international roaming in the Asia Pacific region and to develop acceptable international roaming rates. No agreement on action plan or timeline to implement any roaming regulation.	South Asia countries

Source: Informa, 2010, pg. 52

2.10.2. Europe

Europe, with 208m roaming users in 2009, was the largest roaming market and the first to introduce roaming regulation (Informa, 2010). Sutherland (2008) argued that the European Union (EU) spent about 10 years unsuccessfully trying to convince European Mobile Network Operators (MNOs) to voluntarily reduce the high roaming tariffs and to bring them in line with domestic tariffs, before finally imposing tariff regulation in 2007. Informa (2010) further explained that the EU regulator aims to cut roaming tariffs to zero by 2015.

Table 12: European Commission roaming regulation update

Date	Regulation
Jun 2007	Voice roaming regulation defining maximum wholesale and retail tariffs. The regulation has four basic concerns:
	Wholesale charges; Retail charges, Retail price transparency; Supervision and enforcement.
Feb 2008	The High Court of Justice of England and Wales granted permission for Vodafone Group, Telefonica O2 Europe, France Telecom and T-Mobile to challenge the legal basis of the EU roaming regulations.
Sep 2008	A leaked document made it clear that the European Commission (EC) fully intends to go ahead with proposals to regulate SMS and data roaming
Jul 2009	Amended roaming regulation addresses:
	Voice per second billing
	No charge for receiving a voicemail while roaming
	SMS regulation: Home providers are required to provide basic personalised pricing information on SMS and data roaming services;
	Sending an SMS when roaming (excluding VAT) will not exceed 11 Euro cents (4 cents at wholesale level).
Mar 2010	Home providers to offer a "cut off limit" facility expressed either in volume or financial terms but in any case to include a €50 limit default option.
	Wholesale charge for data roaming shall not exceed a safeguard limit of €1 per MB from 1 July 2009; €0.80 from 1 July 2010; and €0.50 from 1 July 2011 – charged on a per kilobyte basis.
Future work	Commission to issue a report no later than 30 June 2010
	Commission to review and report to European Parliament and Council on the functioning of the regulation no later than 30 June 2011.

Source: Informa, 2010, pg. 58.

Table 12 shows the timeline of events from the introduction of the first roaming regulation in 2007 through the various amendments to extend the scope of the

regulation. Informa (2010) explained that the expected large increase in roaming usage after the retail tariff reductions did not materialise, probably due to the prevailing economic downturn which affected most western countries. In response, MNOs sought to increase retail roaming revenues by introducing some special roaming plans (Informa, 2010).

2.10.3. North America

North America had relatively few roamers in 2009 (46m) the majority of whom travelled between the USA and Canada (Informa, 2010). In contrast the USA received 58m visitors, resulting in high wholesale roaming revenues for US mobile operators (Informa, 2010). Informa (2010) argued that due to intense competition and the resulting low tariffs, there has been no need to regulate either national or international roaming tariffs.

2.10.4. Latin America

Although roaming tariffs in Latin American are still expensive, these countries are focusing on extending the reach of roaming and implementing transparency measures, with no immediate plans to regulate tariffs (Informa, 2010).

2.10.5. Middle East

The Arab Regulators Network (AREGNET) which represents the telecommunications authorities of 21 Middle East countries, argued that self regulation had not reduced the high roaming tariffs in the region and started considering the regulation of roaming in 2006 (Sutherland, 2008). Despite several proposals to link the roaming tariffs to the domestic tariff of an equivalent call, there has been little progress in implementing the Memorandum

of Understanding (MoU) and recommendation on roaming (Sutherland, 2008 and Informa, 2010).

2.10.6. Africa

Gillwald and Mureithi (2010), Sutherland (2010a) and ITU (2008) have all highlighted how Zain's One Network, along with the competitive responses from MTN and Vodacom/Vodafone, removed the roaming surcharge in many African and Middle Eastern countries. This development removed the need for regulatory intervention on international mobile roaming in East, Central and West Africa where Zain has networks (Sutherland, 2010; Gillwald & Mureithi, 2010).

2.10.7. Southern Africa

Southern Africa has not experienced the dramatic reductions in roaming tariffs that were seen elsewhere on the continent, prompting the Ministers responsible for Communications to request the national regulators to intervene in order to reduce tariffs (Analysis Mason, 2010). This initiative is ongoing and no regulation has yet been finalised (Analysis Mason, 2010; Sutherland, 2010).

2.11. Research objectives

Objective 1: To determine international mobile roaming usage patterns by user segment and relative to alternative communication methods.

Objective 2: To determine whether users perceive regulatory intervention to be more effective than competition in reducing international mobile roaming retail tariffs.

Objective 3: To determine whether demand is elastic and if a reduction in international mobile roaming retail tariffs will result in increased usage.

Objective 4: To determine whether users perceive that regulatory intervention reduces competition by forcing operators out of the market.

The reviewed literature demonstrated that total welfare, the sum of consumer and producer surplus, is increased when international mobile roaming (IMR) retail tariffs are reduced in response to competitive pressures without regulatory intervention (Sutherland, 2010; Gillwald & Mureithi, 2010 and Analysis Mason, 2010). In the absence of competition in the IMR market, communications regulators are increasingly taking steps to intervene in order to reduce retail tariffs (Sutherland, 2010; OECD, 2009; Gillwald & Mureithi, 2010 and Analysis Mason, 2010).

Lower retail IMR tariffs, as a result of operator initiatives or regulatory intervention, are likely to increase consumer surplus at the expense of producer surplus or profits unless consumer demand increases significantly (CEC, 2008).

Informa (2010) identified two distinct groups of roaming users with different usage patterns and demand elasticity. The consumer segment is comprised mostly of price conscious leisure travellers whose demand for international mobile roaming is very price elastic. Business users are generally price inelastic due to their necessity to keep in touch with the office and the fact that the company pays the cellular usage bill.

3. RESEARCH HYPOTHESES

3.1. Introduction

The research report will investigate the level of usage of alternative communication methods by cross border visitors, and whether competition is more effective than regulation in reducing international mobile roaming retail tariffs. The research questions are clarified through propositions, which are subsequently tested by way of hypotheses. These hypotheses are supported by literature as set out in appendix 4.

3.2. Research Question 1

What is the level of usage of international mobile roaming (IMR) by Cross-border travellers, specifically business versus consumer travellers?

Proposition 1: Business travellers use international mobile roaming (IMR) more frequently than do consumer travellers.

Hypothesis 1:

The null hypothesis states that the frequency of using international mobile roaming (IMR) is the same for business and consumer cross border visitors.

The alternative hypothesis states that the frequency of using international mobile roaming is higher for business travellers than for consumer travellers.

$$H1_0: \mu_B = \mu_C$$

$$H1_A: \mu_B > \mu_C$$

A t-test for independent groups was used to perform the analysis.

3.3. Research Question 2

What is the usage level of alternative communication methods by Cross-border travellers, specifically business versus consumer travellers?

Proposition 2: Cross border visitors use alternative communication methods (ACM) more than they do international mobile roaming (IMR).

Hypothesis 2:

The null hypothesis states that the frequency of using international mobile roaming (IMR) relative to alternative communication methods (ACMs) is the same for business and consumer travellers. The alternative hypothesis states that the frequency of using international mobile roaming relative to alternative communication methods is higher for business than consumer travellers.

$$H_{2_0}: \mu_B = \mu_C;$$

$$H_{2_A}: \mu_B > \mu_C$$

A t-test for independent groups was used to perform the analysis.

3.4. Research Question 3

Have international mobile roaming retail tariffs decreased?

Proposition 3: International mobile roaming (IMR) retail tariffs have decreased due to competition.

Hypothesis 3:

The null hypothesis states that users perceive that international mobile roaming (IMR) retail tariffs have not reduced. The alternative hypothesis states that users perceive that international mobile roaming retail tariffs have reduced (TR).

$$H_{3_0}: \mu_{TR} \leq 3;$$

$$H_{3_A}: \mu_{TR} > 3 \text{ (scale midpoint)}$$

A t-test was used to perform the analysis.

Hypothesis 4:

The null hypothesis states that users perceive that competition did not play a greater role than regulation in reducing international mobile roaming retail tariffs. The alternative hypothesis states that users perceive that competition played a greater role than regulation in reducing international mobile roaming retail tariffs.

$$H_{4_0}: \mu_{Com} = \mu_{Reg};$$

$$H_{4_A}: \mu_{Com} > \mu_{Reg}$$

A t-test was used to perform the analysis.

3.5. Research Question 4

Will there be an increase in usage of international mobile roaming if the tariff is reduced?

Proposition 4: A reduction in international mobile roaming (IMR) retail tariffs results in increased IMR usage.

Hypothesis 5:

The null hypothesis states international mobile roaming (IMR) usage does not increase when the retail tariff is reduced (TR). The alternative hypothesis states that IMR usage increases when the retail tariff is reduced.

$H_{5_0}: \mu_{TR} = 3;$

$H_{5_A}: \mu_{TR} > 3$ (scale midpoint)

A one-sample t-test was used to perform the analysis.

3.6. Research Question 5

Will regulatory intervention reduce competition?

Proposition 5: Regulatory intervention does not reduce competition.

Hypothesis 6:

The null hypothesis states that users perceive that regulatory intervention (RI) reduces the number of mobile network operators. The alternative hypothesis states that users perceive that regulatory intervention (RI) does not reduce the number of mobile network operators.

$H_{6_0}: \mu_{RI} = 3;$

$H_{6_A}: \mu_{RI} < 3$ (scale midpoint)

A one-sample t-test was used to perform the analysis.

The consistency matrix in appendix 4 summarises the hypotheses while showing the supporting literature, data collection and analysis methods.

4. RESEARCH METHODOLOGY

4.1. Research design

This research project examined data from individual mobile subscribers in the SADC region to verify the extent to which competition was perceived to have reduced international mobile roaming (IMR) retail tariffs, whether regulatory intervention was perceived likely to be effective and whether the demand for IMR services is elastic.

International mobile roaming has been extensively studied for longer than a decade, for example by Sutherland (2001; 2008; 2010a; 2010b; & 2010c), Salsas and Koboldt (2004), Commission of the European Communities (CEC, 2006), Gillwald and Mureithi (2009 & 2010), and the International Telecommunication Union (ITU, 2008). Zikmund (2003) suggests that in such cases where there is some knowledge of the subject, quantitative design is appropriate.

Descriptive research was used since it helps to answer the questions who, what, when, where and how, while determining the extent of differences in the needs, perceptions and attitudes of sub groups (Zikmund, 2003).

4.2. Population of relevance and Unit of analysis

Population of relevance

The population of relevance consisted of individual mobile subscribers who are resident in a SADC country and who have travelled to another country in the region. Analysis Mason (2010) estimated that there were 12.3 million intra

SADC tourists during the year 2009. If we apply the SADC average of 40.5 mobile subscribers per 100 persons (ITU, 2010b) to these intra SADC tourists, we obtain a large population of relevance of approximately 4.9 million intra SADC tourists who have mobile phones.

Unit of analysis

The unit of analysis is the individual respondent – a mobile subscriber in the SADC region who has travelled to another country in the region.

4.3. Sample size and method

Chipp (2010) recommends that when performing quantitative analysis the sample size must be larger than 50 in order to ensure that it is representative of the population, no particular group must be excluded and selection of the sample units must be random. In order to ensure that the data was credible a high response rate of 40% to 50% was required (Chipp, 2010).

Non-probability stratified sampling (Zikmund, 2003) was used to ensure widespread representation from many countries in SADC. Due to the different characteristics of the two user segments, consumers and business users, it was necessary to obtain at least 30 samples from each segment. Within each country efforts were made to obtain responses from a wide cross section of the population. Some of the targeted groups in each country included staff of the communications regulator, mobile and fixed network operators, as well as individual consumers.

Considering the need for at least 30 samples from each of the two user segments, a sample size of 100 was selected.

4.4. Data collection

An online questionnaire, a copy of which is shown in appendix 6, was employed to collect data. An email invitation containing details of the survey and a link to the questionnaire was sent to prospective respondents. The questionnaire was pre tested with a panel of 12 experts to obtain critical feedback on the amount of time required to complete it, clarity of language and questions, and any general suggestions for improvement.

The selected online tool, SurveyMonkey (www.surveymonkey.com), enabled the author to reach a large sample quickly (Zikmund, 2003) while ensuring convenience and anonymity for respondents. Respondents were asked to complete the survey within 7 days, although this was extended for another week in order to ensure that there was sufficient representation from the different countries in the region.

The author used several methods to obtain responses from a wide cross section of the population in each country. The survey was sent to regional communications organisations such as the Southern African Telecommunications Association (SATA) which mostly represents the former fixed line incumbent operators, and to the GSM Southern Africa which represents the GSM mobile operators. These two industry bodies were requested to encourage their members, who operate fixed and mobile networks respectively, to publicise the survey on their websites in order to obtain responses from their subscribers and staff. The survey was also sent to the Communications Regulators' Association of Southern Africa (CRASA) for distribution to its members, including the communications regulator in each

country, who were requested to publicise the survey on their respective websites and to distribute the link to their database of users who are interested in keeping abreast of regulatory developments.

Figure 10 shows the decision tree that was followed to arrive at the research design of using a self administered electronic survey.

4.5. Data analysis

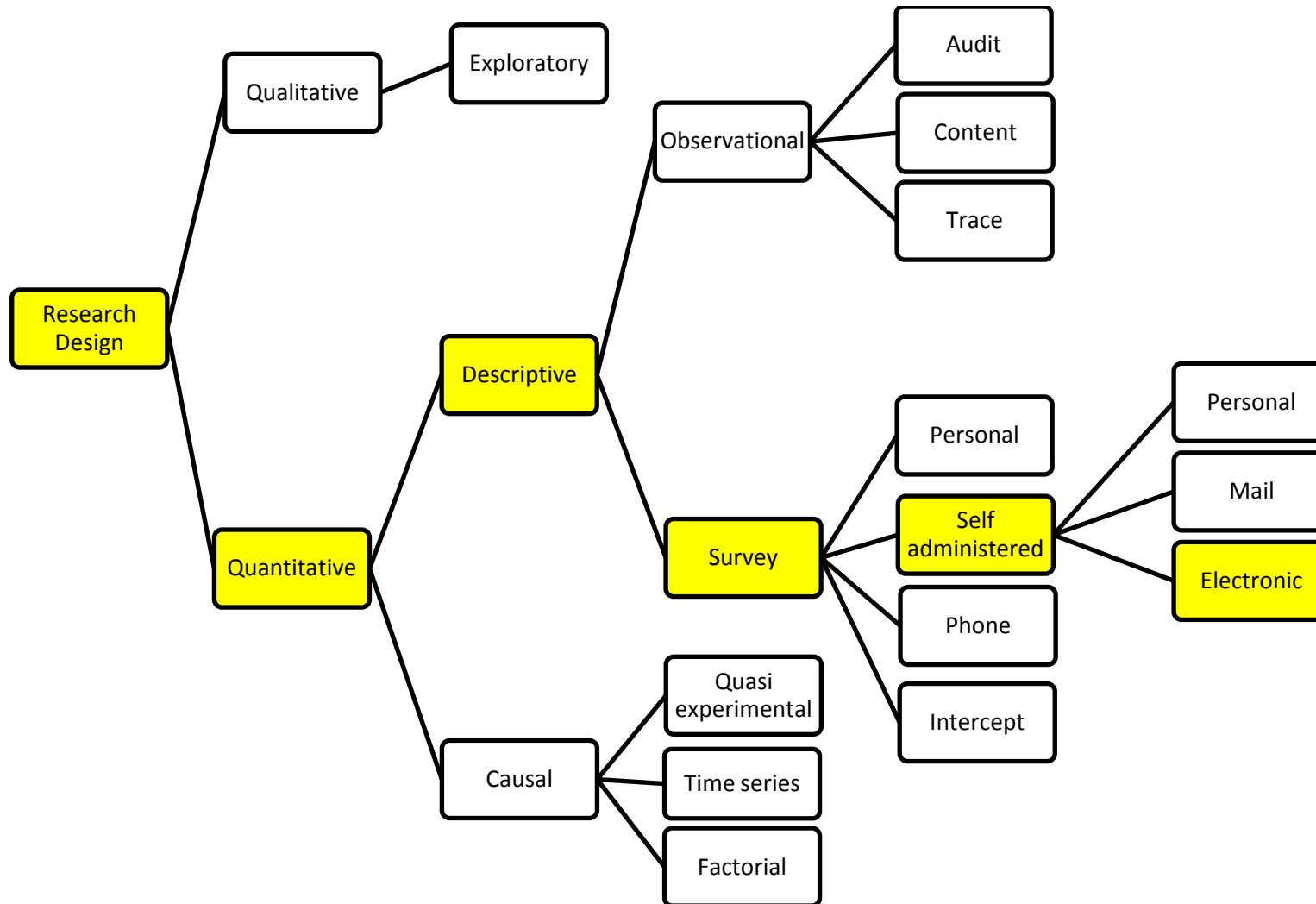
The analysis was first performed on the aggregated data to obtain general trends in the SADC region. The same analysis was then performed on each of the two user groups in order to establish whether there were any marked differences among mobile subscribers in the consumer and business segments.

Descriptive statistics such as mean and standard deviation, along with frequency distributions, cross tabulations, and t-tests were used to analyse the data.

4.5.1. Descriptive statistics

Diamantopoulos and Schlegelmilch (2000) recommend that data analysis should start with descriptive statistics, which allow the author to “get to know the data” before trying something more adventurous. Frequency distributions in the form of frequency tables and pie charts were used to describe the variables of interest.

Figure 10: Research design decision tree



4.6. Research limitations

The stratified sample used in this research project did not allocate the sample size for each country in a manner that was proportional to its population and mobile penetration. This resulted in South Africa, which has a population of 50.1 million people, being allocated the same sub sample size as Lesotho which has a population of 2.1 million people. The sample may not be representative of the entire population, and various sub-groups such as specific countries in the SADC region may be under or over represented (Chipp, 2010).

The lack of computer ownership and Internet access among large sections of the population (ITU, 2010b) makes the sample non-representative of the general population (Zikmund, 2003).

Self selection bias, where extreme positions are over represented, may be a problem in this type of self-administered survey (Zikmund, 2003). This is because those people who feel strongly about the subject, for example the staff of mobile network operators and communications regulators – who hold opposing views, are more likely to respond to the survey. Non-response error may also be an issue since many people may not respond to the survey due to lack of interest (Zikmund, 2003 and Chipp, 2010). These two types of error reduce the likelihood of the respondents being representative of the population.

Researcher bias may be introduced since the author is employed by a mobile network operator which has licences to operate in several SADC countries. This has the potential to influence the survey design and interpretation of the results to reflect positively on mobile operators.

The author mitigated the possibility of researcher bias by using a 12 person panel of experts to pre-test the questionnaire. The members of this panel live in three different SADC countries and possess a good mix of commercial, regulatory and academic expertise. The panel has representatives from mobile and fixed operators, communication regulators and civil society as can be seen in Appendix 5.

5. RESULTS

5.1. Introduction to results

The results of this research project are presented in the form of tables and graphs. This section proceeds with a description of the demographic variables of home country, visited countries, household income, type of cellular package and party making payment for cellular usage. Thereafter, the results are grouped according to the hypotheses presented in Chapter 3.

The aim of this study was to investigate the usage patterns of international mobile roaming (IMR) and alternative communication methods, the effect of market competition and regulation on IMR tariffs and the demand elasticity. Where appropriate, the responses were divided into two subgroups - business and consumer users, for analysis. The full statistical results and the calculations can be found in Appendix 7: Statistical results.

In total 111 responses were received. Three of these respondents did not travel to another SADC country therefore these responses were deleted since they did not meet the qualifying criteria. Ten other respondents provided answers to the demographic questions only, and were eliminated from the sample since most of their other values were missing. This left 98 valid responses on which the analysis was performed.

The responses to question 13.1 of the questionnaire were deleted since this question on whether the respondent used his/her home SIM card to roam was addressed in the three following questions which asked whether the respondent used voice, SMS or data while roaming.

5.2. Coding

Table 13 shows the coding scheme that was used on the responses to the questions with Likert-type scales. The Likert-type scale text responses from scale 1 (question 13) and scale 2 (questions 14 to 18) were converted to equal interval numbers in order to assist with the quantitative analysis.

Table 13: Coding scheme for Likert-type scales

Scale 1	Code	Scale 2
Always	5	Strongly agree
Often	4	Agree
Fairly often	3	Neither agree nor disagree
Hardly	2	Disagree
Never	1	Strongly disagree

5.3. Analysis of Likert-type scale data

Likert scale data can be considered ordinal with unequal intervals or interval with equal interval scales. While parametric tests such as the mean can be calculated for equal interval data scales, it is inappropriate to do the same for unequal interval data. Ordinal data is best presented in the form of frequency distributions. In this research project mean analyses are used, assuming that the Likert-type scales are equal interval.

5.4. Demographic data

This section describes the demographic profile of the valid responses. Anonymity of the respondents was assured by not asking for, nor recording any easily identifiable personal information. Table 14 indicates the home country of respondents. South Africa had the highest representation with 61%, while the next highest was Zambia with 10% of the respondents. Thirteen of the fifteen

SADC countries are represented in the survey. Madagascar and Seychelles were the two countries with no respondents.

Table 14: Frequency table - Home country of respondents

Home country	Frequency	Percentage
Angola	1	1.0
Botswana	5	5.1
Democratic Republic of Congo	2	2.0
Lesotho	4	4.1
Malawi	5	5.1
Mauritius	2	2.0
Mozambique	2	2.0
Namibia	4	4.1
South Africa	60	61.2
Swaziland	1	1.0
Tanzania	1	1.0
Zambia	10	10.2
Zimbabwe	1	1.0
Total	98	100.0

Table 15: Frequency table showing monthly household income

Monthly household income	Frequency	Cumulative Frequency	Percentage	Cumulative Percentage
Less than USD50	1	1	1.0	1.0
USD50 to USD200	2	3	2.0	3.0
USD201 to USD500	4	7	4.1	7.1
USD501 to USD2,000	20	27	20.4	27.5
USD2,001 to USD5,000	21	48	21.4	49.0
More than USD5,000	50	98	51.0	100.0

Table 15 shows that almost three-quarters (72%) of respondents have household incomes greater than USD2,000, while only 3% earn USD200 or less per month. This suggests that the majority of respondents are fairly well off. This variable is useful for predicting international mobile roaming uptake.

Figure 11 indicates that three-quarters (75%) of total respondents are on post paid/contract cellular packages, while almost one-quarter (24%) are on prepaid packages. There was 1% missing values.

Figure 11: Pie chart showing type of cellular package

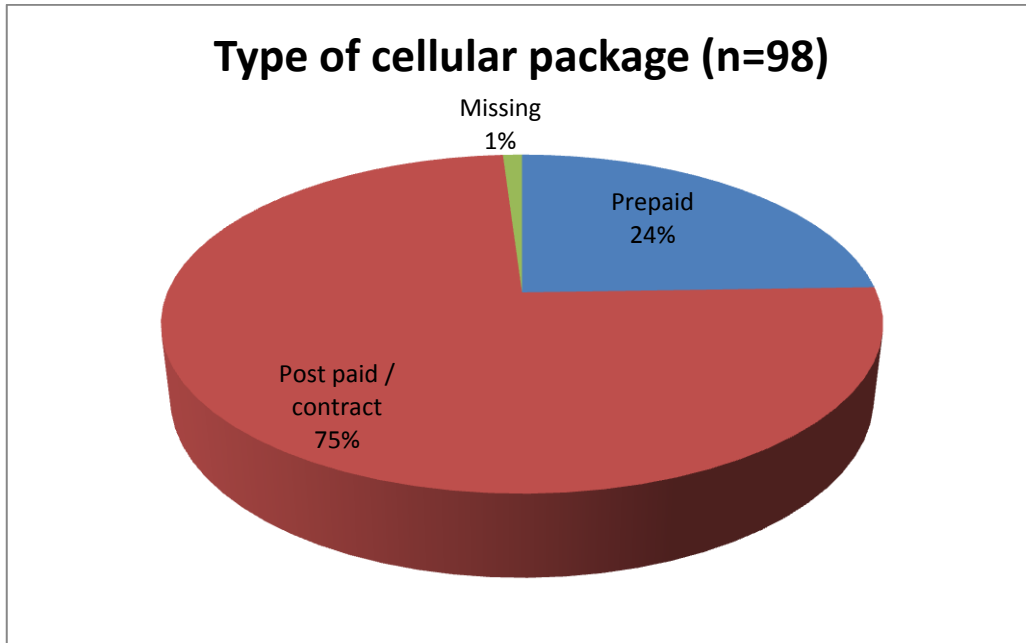


Figure 12: Pie chart showing who pays for cellular usage

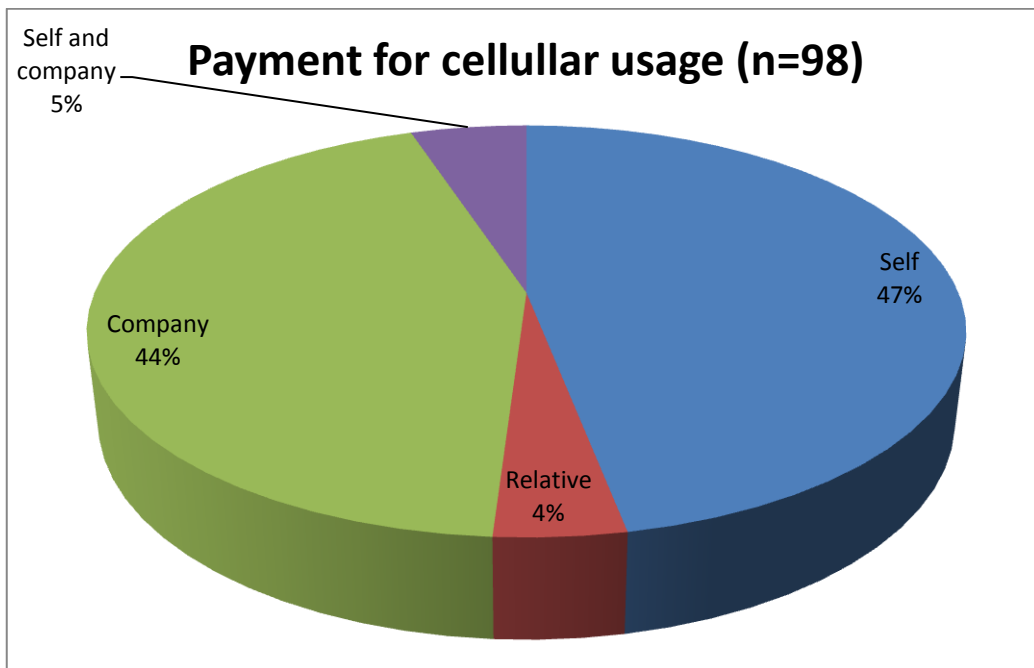


Figure 12 shows that companies pay in full for the cellular usage of 44% of the respondents (Business segment), while just over half (51%) of the respondents pay for themselves in full or with the assistance of relatives (Consumer segment). The remaining 5% of respondents pay for part of their cellular usage with the company providing some assistance.

Table 16: Multiple response frequencies of visited countries

Multiple response frequencies of visited countries	Frequency	Percent of cases (n=98)
Angola	4	4.2
Botswana	37	39.0
Democratic Republic of Congo	1	1.1
Lesotho	17	17.9
Madagascar	0	0.0
Malawi	9	9.5
Mauritius	9	9.5
Mozambique	32	33.7
Namibia	18	19.0
Seychelles	1	1.1
South Africa	37	39.0
Swaziland	23	24.2
Tanzania	15	15.8
Zambia	19	20.0
Zimbabwe	28	29.5

Table 16 indicates that South Africa and Botswana were visited by the largest proportion of respondents (39% each), followed by Mozambique (34%), Zimbabwe (30%), Swaziland (24%), Zambia (20%), Namibia (19%), Lesotho (18%) and Tanzania (16%). These percentages add up to more than 100% since each respondent was asked to choose their top three destinations in the SADC region, resulting in multiple selections by many respondents.

The next section considers the composition and characteristics of the various subgroups.

5.5. Usage clusters

5.5.1. Calculated clusters

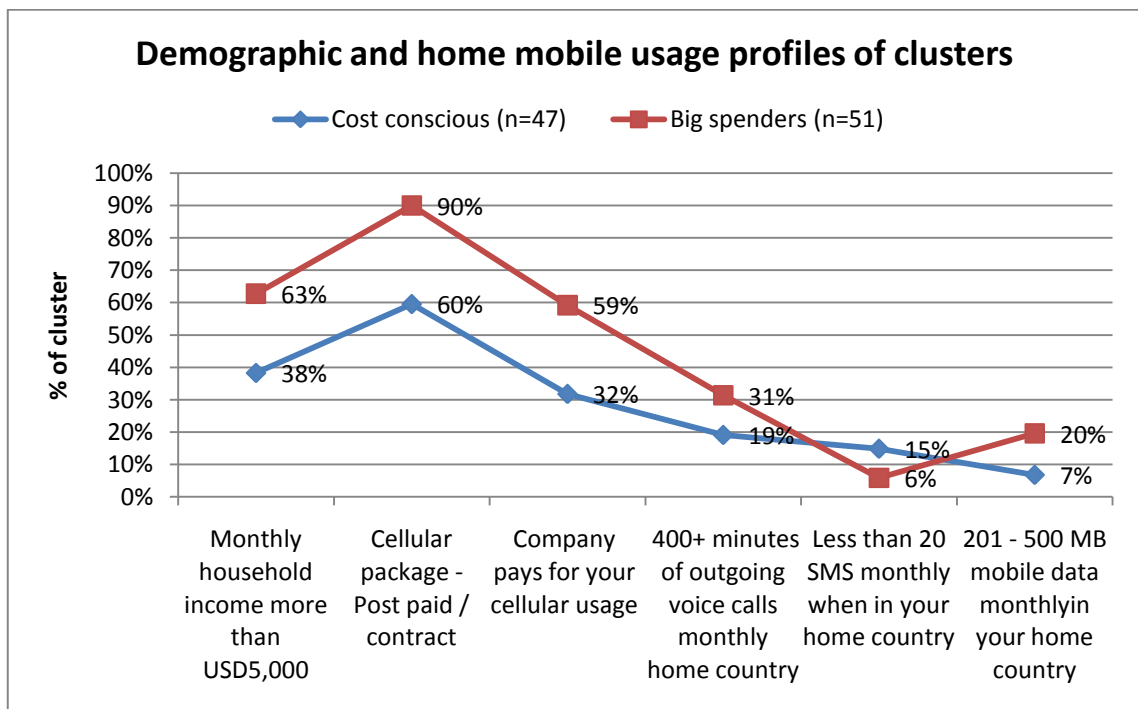
Cluster analysis of the responses for usage of international mobile roaming (IMR) relative to alternative communication methods (question 13) shows that there are two distinct groups of respondents – Big Spenders and Cost Conscious, as seen in appendix 7.1.1. The Big spenders (n=51) display high usage of IMR relative to alternative communication methods, with means equal to or greater than 4.3 in all cases except “use of roaming data” (mean of 3.1) and preference for “SMS instead of voice roaming” (mean of 2.2). Almost two-thirds of this cluster (63%) have a household income of more than USD5,000 per month, more than three-quarters (90%) of them are on a contract or post paid cellular package, three-fifths (59%) have their cellular usage paid for by their companies while just less than one-third (31%) use more than 400 minutes of outgoing calls per month when at home (Figure 13).

The Cost conscious cluster (n=47) shows low mean usage of IMR relative to ACM, with means equal to or less than 2.0 for use of “mobile data” and “home SIM” relative to all alternative communication methods (ACMs) except “SMS usage” (2.9) and use of a “local SIM card” (mean of 2.4). The Cost conscious cluster (n=47) is less wealthy with 38% having a household income of greater than USD5,000 per month. Almost one-third (32%) of the Cost conscious cluster have their cellular usage paid for by their companies, while heavy voice users (400+ minutes of outgoing calls per month) comprise 19% of the cluster.

Appendix 7.1.1 shows that the roaming usage pattern for the two calculated clusters (Big spenders and Cost conscious) is vastly different. The Big spenders

often or always (mean >4) make use of IMR and generally do not use alternative communication methods. In contrast, members of the Cost conscious cluster hardly or never (mean <2) use international mobile roaming. Both clusters show low levels of roaming data usage.

Figure 13: Demographic and home mobile usage profiles of calculated clusters



5.5.2. Business and consumer user segments

In this report the business segment corresponds to those respondents whose cellular usage is paid for by their companies, while the consumer segment is comprised of those respondents whose cellular usage is paid by private individuals (self or relative). The business segment contains 43 samples while the consumer segment has 50. The five respondents who have a split between self and company payment of cellular usage were not put into either the business or consumer segment since they have characteristics of both.

The international mobile roaming (IMR) usage preference of the business and consumer segments, as shown in appendix 7.1.2, follow a similar pattern to those of the Big spenders and Cost conscious clusters. The differences between these two user segments are not as pronounced as those for the calculated clusters (Big spenders and Cost conscious). This result is expected as the cluster analysis technique is designed to maximise the differences between the clusters and minimise the distances within clusters based on the clustering variables, in this case all the usage variables. Such an optimal solution would not be realised using only a single variable, “who pays the account.” However, in order to make the research easier to replicate in the industry practice, this latter variable was adopted for splitting the groups instead of the calculated cluster solution.

5.6. Research Question 1

What is the level of usage of international mobile roaming (IMR) by Cross-border travellers, specifically business versus consumer travellers?

Two approaches are used to answer research question 1. The first approach examines all respondents as a single group. It is merely descriptive, no hypothesis is framed - rather tables and graphs of means are presented. The second approach is comparative and is underpinned by a proposition and hypothesis.

5.6.1. Descriptive statistics of IMR usage

Figure 14 shows that almost one-fifth (18%) of cross border travellers switch off their cellular phones, while almost one-quarter (22%) use only SMS/text messaging when they visit another country in the region. Almost three-fifths

(58%) of cross border visitors use both SMS and voice calls, one-third (33%) use both SMS and data, just less than one-third (31%) use both voice and data, while just less than one-third (31%) use all three methods (voice, SMS and data). None of the cross border travellers use only voice or only data when visiting another country in the SADC region.

Figure 14: Usage of individual communication methods while roaming

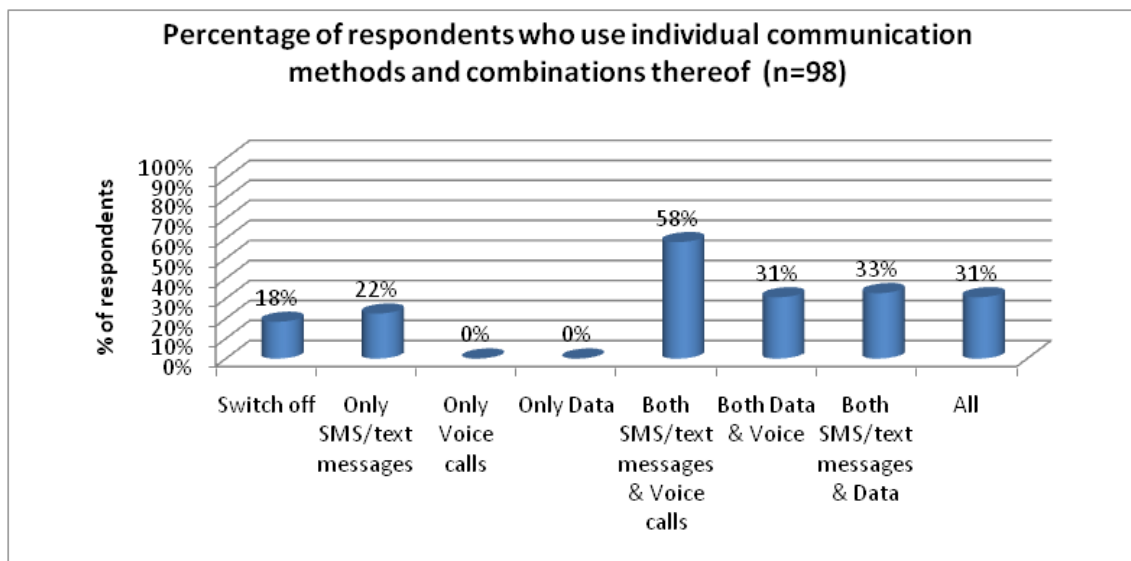


Table 17: International mobile roaming usage by all respondents

All respondents: N = 98	Mean	Std. Dev.	Std. Err.	Reference	t-value	p
to make roaming voice calls.	3.3	1.57	0.16	3.0	1.610	0.11062
to send SMS/text messages when I roam.	3.9	1.41	0.14	3.0	6.031	0.00000
to access mobile data when I roam.	2.4	1.44	0.15	3.0	-4.426	0.00003

Note: Extracted from appendix 7.2

Table 17 shows that the usage of roaming voice calls by all respondents is close to the scale midpoint of 3 (mean of 3.3; $t(97) = 1.61$; $p > 0.05$). Additionally, roaming SMS usage (mean of 3.9; $t(97) = 6.03$; $p < 0.05$) is greater than, while mobile data usage (mean of 2.4; $t(97) = -4.43$; $p < 0.05$) is less than the scale midpoint 3.

The mean usage statistics of all respondents as shown in Table 17 present a skewed picture since they do not show the large differences in usage between the business and consumer segments. For roaming voice calls the business and consumer segments, with means of 3.9 and 2.7 respectively, in effect cancel each other to leave the overall mean (3.3) close to the scale midpoint. In view of this difference in means between the business and consumer subgroups, the hypotheses were tested on the individual subgroups where appropriate.

5.6.2. Hypothesis 1

Figure 15 and Table 18 show that the mean usage of international mobile roaming (voice, SMS and mobile data) by business travellers is higher than that of consumers.

Figure 15: Usage of international mobile roaming by user type

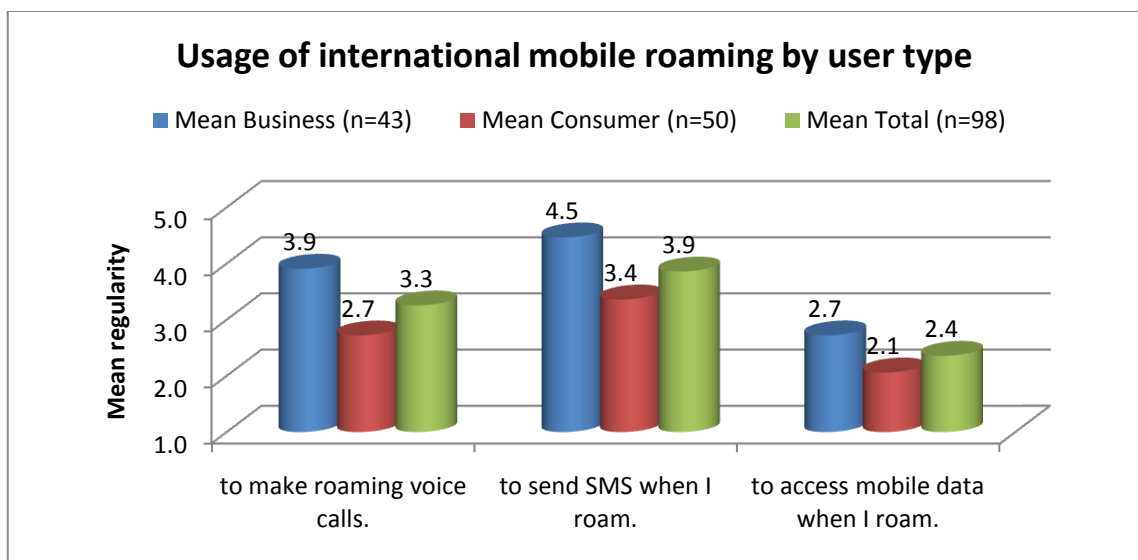


Table 18: Comparison of IMR usage by business and consumer type

Valid N Business = 43; Valid N Consumer = 50	to make roaming voice calls	to send SMS/text messages when I roam	to access mobile data when I roam
Mean Business	3.9	4.5	2.7
Mean Consumer	2.7	3.4	2.1
Mean Difference	1.2	1.1	0.6
t-value	3.872	4.188	2.202
df	91	79.92	91
p	p<0.001	p<0.001	p<0.05
Std. Dev. Business	1.32	0.91	1.61
Std. Dev. Consumer	1.59	1.59	1.28
F-ratio Variances	1.444	3.051	1.568
p Variances	0.2251	0.0003	0.1297

Note: Extracted from appendix 7.3

For all three items of IMR the mean difference (Business – Consumer) is greater than zero, and $p < 0.05$. Both business and consumer travellers use SMS/text messages the most (mean of 4.5; and 3.4 respectively) and mobile data the least (means of 2.7 and 2.1 respectively), with the frequency of voice roaming in between that of SMS/text messages and mobile data (means of 3.9 and 2.7 respectively).

5.7. Research Question 2

What is the usage level of alternative communication methods by Cross-border travellers, specifically business versus consumer travellers?

The first approach examines all respondents as a single group. It is merely descriptive, no hypothesis is framed - rather tables and graphs of means are presented. The second approach is comparative and is underpinned by a proposition and hypothesis.

5.7.1. Descriptive statistics of alternative communication methods usage

More than half of respondents (53%) preferred to use their home SIM card to roam instead of any alternative communication method (ACM) as seen in Figure 16. “Internet telephony” and “other communication methods” were the most preferred alternative communication methods since they were rejected by the lowest proportion (53% each) of respondents. Exchanging the home SIM card for “a local SIM card from the visited country” was the least preferred ACM since two-thirds (67%) of respondents indicated that they did not use it. Use of a hotel phone (64%), public phone (65%) and calling card with local phone (64%) were all rejected by almost two thirds of respondents.

Table 19 shows that the mean of international mobile roaming (IMR) usage relative to ACM is close to 3.0, the scale midpoint, in most cases. The mean IMR usage for the reversed item of “send SMS instead of making roaming voice calls” is less than the scale midpoint 3 (mean of 2.6; $t(97) = -3.19$; $p < 0.001$). Additionally, the mean IMR usage is greater than the scale midpoint of 3 for the items “use of a local SIM card from that country” (mean of 3.4; $t(97) = 2.43$; $p < 0.05$), “use of a hotel phone” (mean of 3.3; $t(97) = 1.83$; $p > 0.05$), “use of a public payphone” (mean of 3.4; $t(97) = 2.4$; $p < 0.05$) and “use of a local calling card” (mean of 3.3; $t(97) = 2.0$; $p < 0.05$).

Figure 16: Usage of home SIM card relative to alternative communication methods

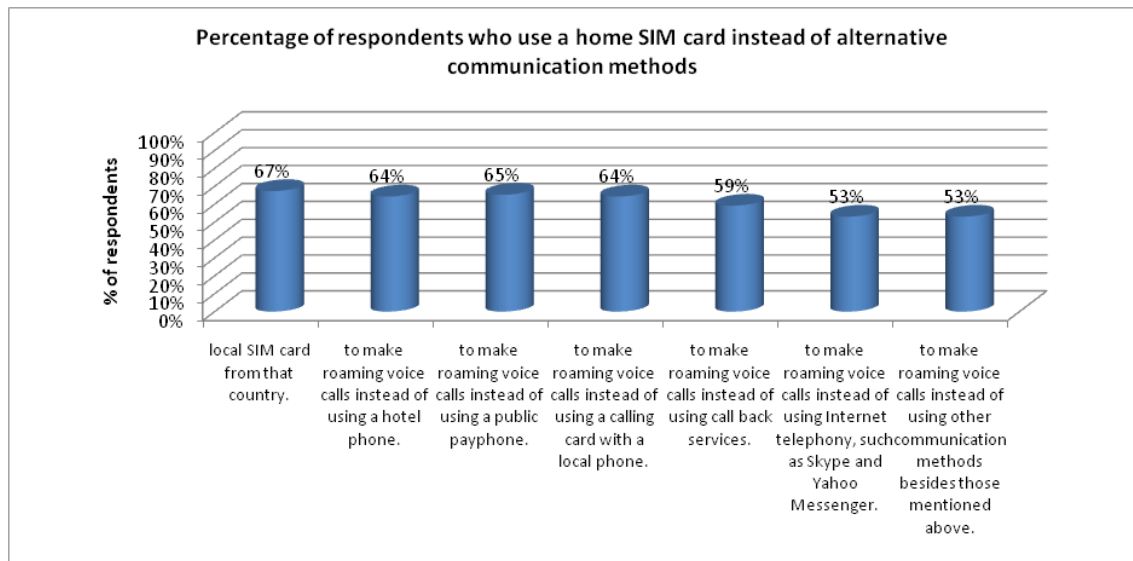


Table 19: Usage of international mobile roaming relative to alternatives - all respondents

N = 98	Mean Total	Std. Dev.	Std. Err.	t-value	p
reverse - send SMS instead of making voice calls.	2.6	1.36	0.14	-3.188	0.00097
roaming - instead of a local SIM card from that country.	3.4	1.58	0.16	2.434	0.01677
roaming voice calls instead of a hotel phone.	3.3	1.66	0.17	1.827	0.07074
roaming voice calls instead of a public payphone.	3.4	1.64	0.17	2.399	0.01833
roaming voice calls instead of a local calling card	3.3	1.62	0.16	1.999	0.04837
roaming voice calls instead of call back services.	3.2	1.70	0.17	1.427	0.15690
roaming voice calls instead of Internet telephony	3.0	1.66	0.17	-0.061	0.95157
roaming voice calls instead of other communication methods	3.0	1.66	0.17	0.243	0.80839

Note: Extracted from appendix 7.2

5.7.2. Hypothesis 2

Hypothesis 2 tests, by user segments, whether cross border visitors prefer to use international mobile roaming (IMR) instead of alternative communication methods (ACM).

Figure 17 shows that business travellers use international mobile roaming (IMR) more often than they use alternative communication methods (mean greater than 3 in all cases except the reversed item of “send SMS instead of making

roaming voice calls”). Consumer travellers use IMR less than ACM as shown by the mean of less than 3 for all items. Business travellers display high preference for international mobile roaming relative to “use of a local SIM card from that country” (mean of 4.0), “use of a hotel phone” (mean of 4.0) and “use of a public payphone” (mean of 4.0). In comparison the consumer travellers displayed low preference for these alternative communication methods with mean scores of 2.9, 2.7 and 2.9 respectively. The reversed item “send SMS instead of making roaming voice calls” is the only one where the mean for consumer is greater than that for business users (2.9 compared to 2.3).

Figure 17: Roaming usage relative to alternative communication methods, by segment

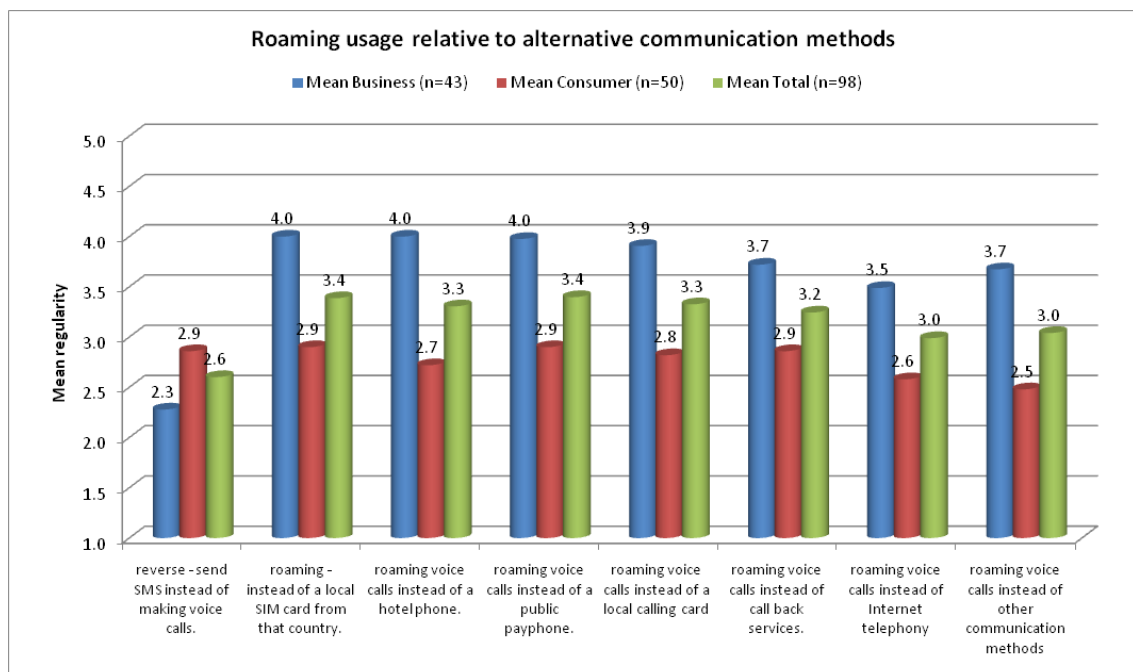


Table 20 shows that for the reversed item “send SMS instead of making roaming voice calls” consumers display higher usage than business users (mean difference of -0.6; $t(97) = -2.03$; $p < 0.05$).

Table 20: Comparison of alternative communication method usage by user segment

	Mean Business	Mean Consumer	Mean Dif.	t-value	p directional	Std. Dev. Business	Std. Dev. Consumer
reverse - send SMS instead of making voice calls.	2.3	2.9	-0.6	-2.028	p<0.05	1.16	1.54
roaming - instead of a local SIM card from that country.	4.0	2.9	1.1	3.477	p<0.001	1.38	1.63
roaming voice calls instead of a hotel phone.	4.0	2.7	1.3	3.994	p<0.001	1.38	1.67
roaming voice calls instead of a public payphone.	4.0	2.9	1.1	3.319	p<0.001	1.34	1.73
roaming voice calls instead of a local calling card	3.9	2.8	1.1	3.416	p<0.001	1.34	1.67
roaming voice calls instead of call back services.	3.7	2.9	0.8	2.484	p<0.05	1.58	1.74
roaming voice calls instead of Internet telephony	3.5	2.6	0.9	2.707	p<0.01	1.55	1.67
roaming voice calls instead of other communication methods	3.7	2.5	1.2	3.678	p<0.001	1.55	1.57

Note: Extracted from appendix 7.3

All other items in Table 20 show that business users display higher preference for IMR over ACM, for example – “use of a local SIM card from that country” (mean difference of 1.1; $t(97) = 3.48$; $p < 0.05$, “use of a hotel phone” (mean difference of 1.3; $t(97) = 3.99$; $p < 0.05$, “use of local calling card” (mean difference of 1.1; $t(97) = 3.42$, $p < 0.05$, and “use of internet telephony” (mean difference of 0.9; $t(97) = 2.71$; $p < 0.05$).

5.8. Research Question 3

Have international mobile roaming retail tariffs decreased?

Descriptive statistics in the form of graphs and tables are used to show respondent perceptions of the level of international mobile roaming retail tariffs relative to domestic tariffs and perceptions of whether IMR tariffs have decreased in recent years.

5.8.1. Descriptive statistics on perceptions about IMR tariffs

Figure 18: Perceptions of whether tariff of local calls is higher when roaming than at home

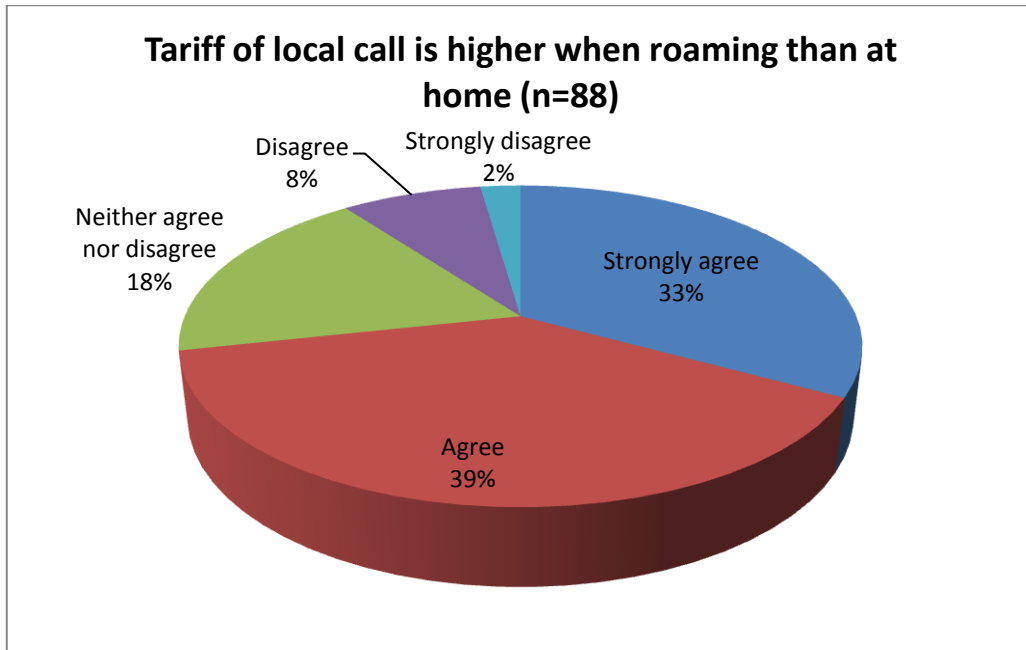
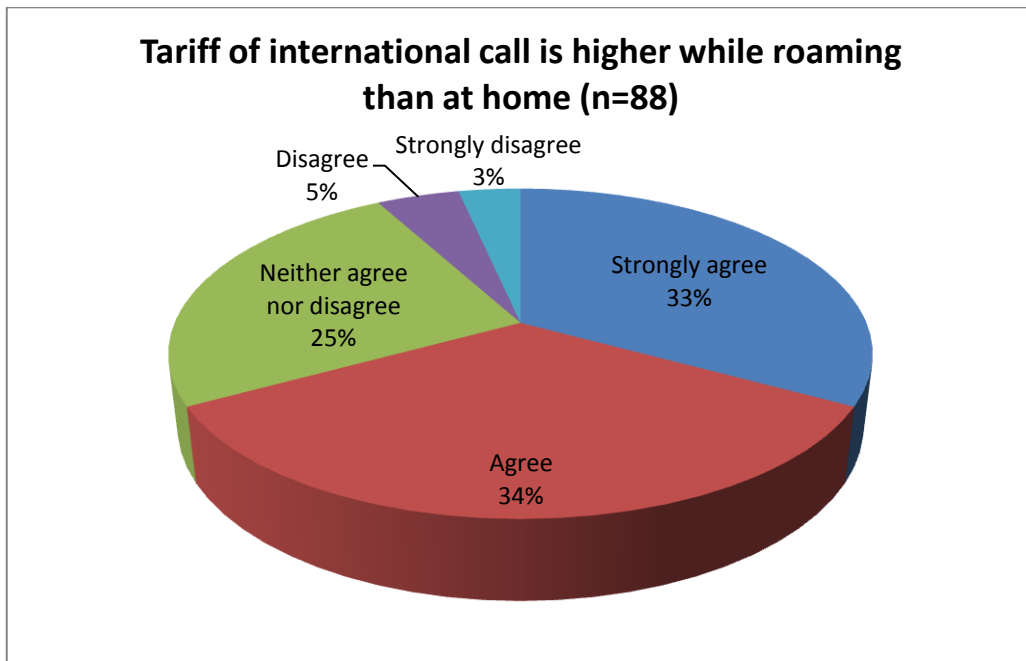


Figure 19: Perceptions of whether tariff of international call is higher while roaming than at home



Almost three-quarters (72%) of respondents agreed that it is more expensive to make a local call while roaming than at home (Figure 18). Similarly, two-thirds (67%) of respondents agreed that it is more expensive to make an international call while roaming than at home (Figure 19).

5.8.2. Hypothesis 3

Figure 20 shows that almost half of the respondents (44%) did not express an opinion (neither agree nor disagree) on the statement that international mobile roaming (IMR) retail tariffs have reduced within the last three years. Only a quarter (26%) agreed with the statement, hence the low mean score of 2.9 ($t(87) = -1.12; p > 0.05$) as shown in Table 21.

Table 21 indicates that the Consumer and Business segments, with mean scores of 2.8 ($t(42) = -1.50; p > 0.05$) and 3.0 ($t(40) = 0.29; p > 0.05$) respectively, are close to the scale midpoint of 3.

Figure 20: Pie chart showing perceptions of whether IMR retail tariff has reduced

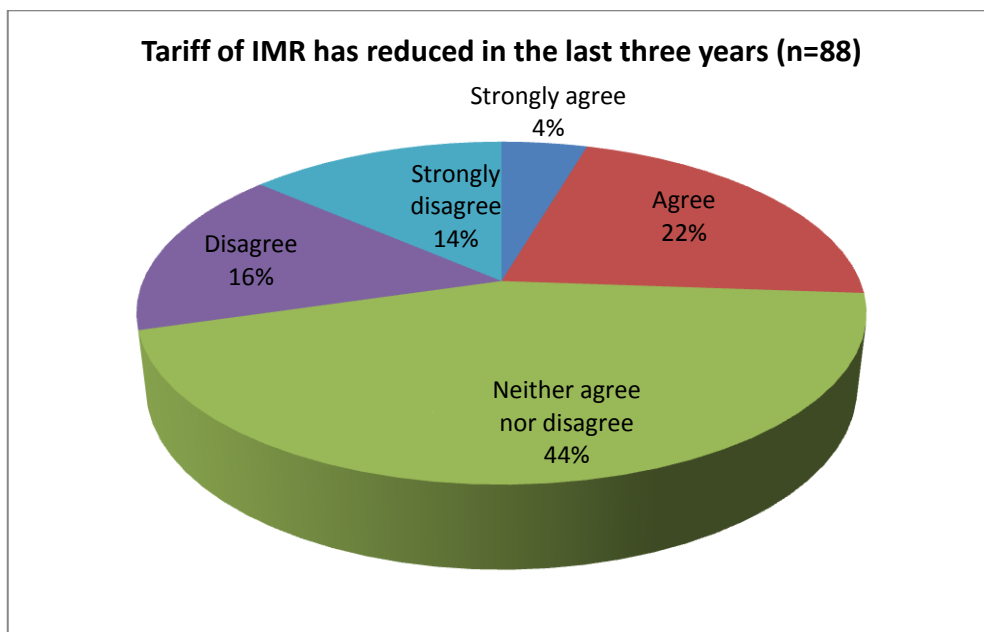


Table 21: T-Test result - IMR tariff has reduced in the last three years

Variable	IMR tariff has reduced in the last three years						
	Descriptive Statistics Section				T-Test For Difference Between Mean and Value Section (X>3)		
	Count	Mean	Standard Deviation	Standard Error	T-Value	Prob Level	Reject H0 at .050
Consumer	43	2.8	1.02	0.16	-1.496	0.92887	No
Business	41	3.0	1.07	0.17	0.292	0.38606	No
Other	4						
Total	88	2.9	1.05	0.11	-1.119	0.86678	No

Note: Extracted from appendices 7.4, 7.5 and 7.6

5.8.3. Hypothesis 4

Of the 23 respondents who agreed that international mobile roaming (IMR) retail tariffs have reduced in the last three years, more than three-fifths (61%) agreed that the reduction was due to competition (Figure 21, and deep orange shading on Table 22) and 7 (30%) agreed that it was due to regulatory intervention (Figure 22, and deep orange shading on Table 23).

Table 22: Cross tabulation of IMR tariff has reduced in last 3 years - due to competition

IMR tariff has reduced in the last three years	Due to competition					Row - Totals
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	
Strongly disagree	6	2	1	2	1	12
Disagree	2	4	5	1	2	14
Neither agree nor disagree	2	4	21	11	1	39
Agree	2	2	4	8	3	19
Strongly agree	0	0	1	1	2	4
All Grps	12	12	32	23	9	88

Figure 21: Pie chart showing perceptions of whether competition reduced IMR tariffs

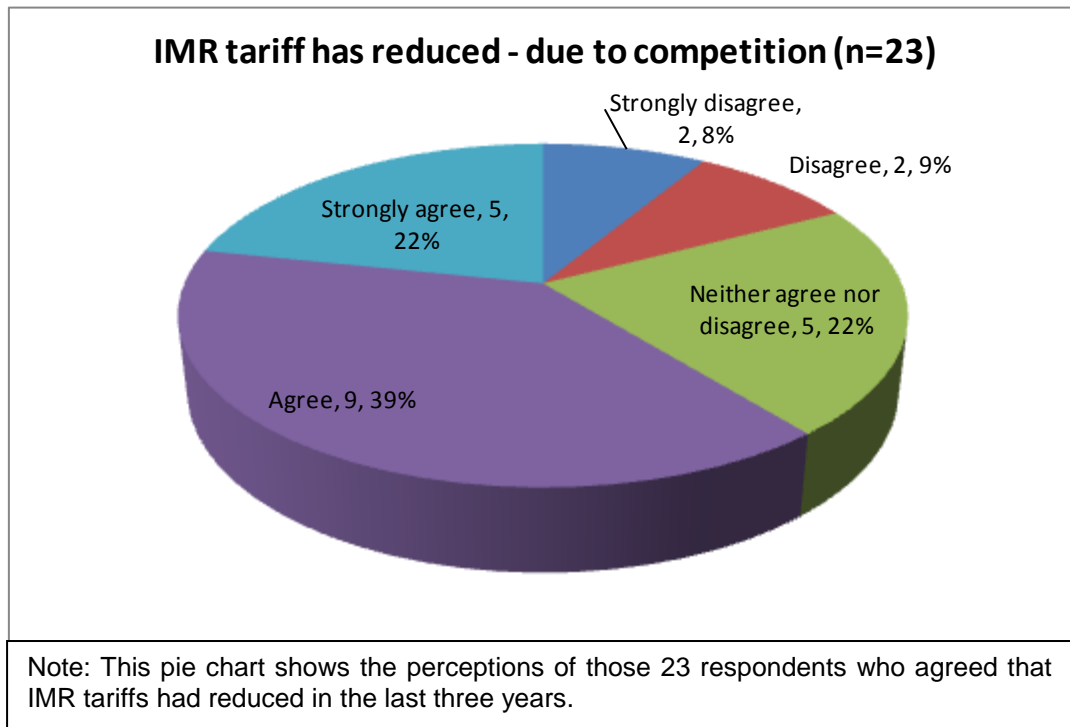


Table 23: Cross tabulation of IMR tariff has reduced in last 3 years - due to regulatory intervention

IMR tariff has reduced in the last three years	Due to regulatory intervention					Row - Totals
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	
Strongly disagree	7	3	0	1	1	12
Disagree	3	5	6	0	0	14
Neither agree nor disagree	2	6	23	7	1	39
Agree	2	4	6	5	2	19
Strongly agree	2	0	2	0	0	4
All Grps	16	18	37	13	4	88

Figure 22: Pie chart showing perceptions of whether regulatory intervention reduced IMR tariffs

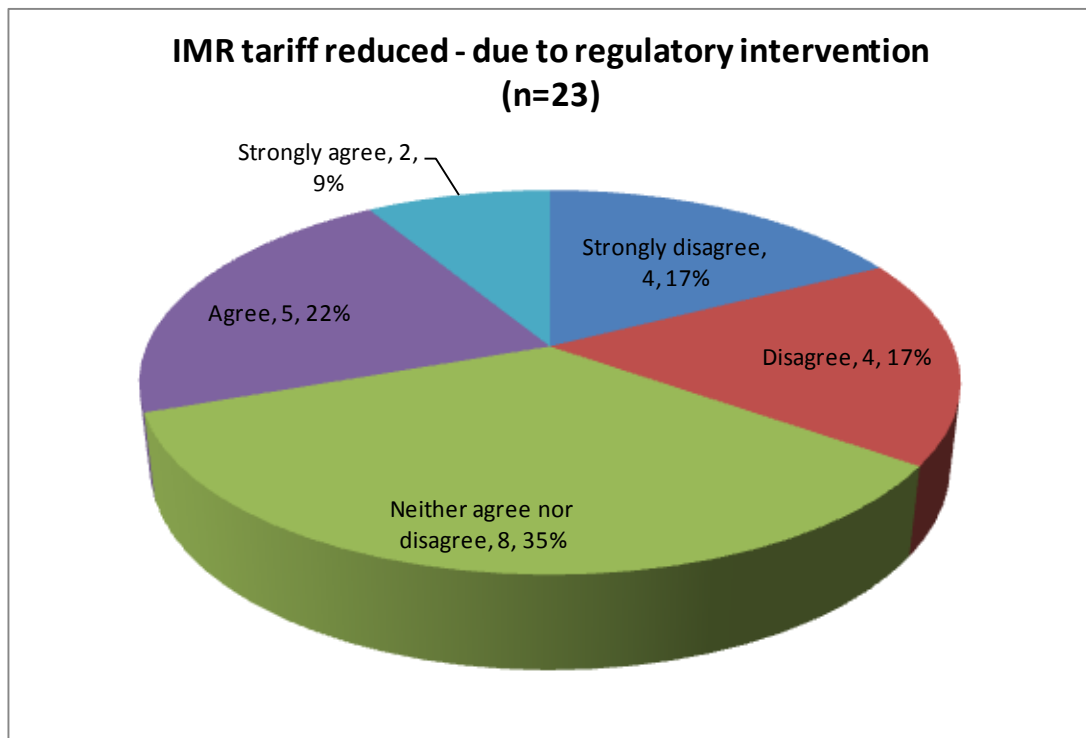


Table 24 indicates that of the 23 respondents who agreed that IMR retail tariffs have reduced in the last three years, 7 (30%) agreed that the reduction was due solely to competition (deep orange shading) while 2 (9%) agreed that it was due solely to regulatory intervention (blue shading).

Table 24: Cross tabulation of IMR tariff reduction due to competition and regulation

due to competition	Due to regulatory intervention					Row - Totals
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	
Strongly disagree	0	0	2	0	0	2
Disagree	0	0	0	2	0	2
Neither agree nor disagree	0	1	3	1	0	5
Agree	2	3	2	1	1	9
Strongly agree	2	0	1	1	1	5
All Grps	4	4	8	5	2	23

Table 25: Comparison of perceptions of whether competition or regulation reduced IMR tariffs

T-test for Dependent Samples								
	Mean	Std. Dev.	N	Diff. Mean	Std. Dev. - Diff.	t	df	p
Competition	3.0	1.18						
due to regulatory intervention	2.6	1.08	90	0.4	1.34	2.680	89	0.004385

Note: Extracted from appendix 7.7

Table 25 shows the results of a related groups t test that compares the two responses for each respondent on the items “due to competition” and “regulatory intervention” as the reason for IMR tariff reduction. The result shows that the mean for competition was greater than that of regulation (difference in means of 0.4; $t(89) = 2.68$; $p < 0.05$).

Table 26: Test of competition mean against scale midpoint of 3.0

Variable	Due to competition			
Descriptive statistics section				
Variable	Count	Mean	Standard Deviation	Standard Error
Due to competition	90	3.0	1.18	0.12
T for Confidence Limits = 1.9870				
Tests of Assumptions Section				
Assumption	Value	Probability	Decision (0.05)	
Skewness Normality	-0.855	0.39235	Cannot reject normality	
Kurtosis Normality	-1.838	0.06603	Cannot reject normality	
Omnibus Normality	4.111	0.12804	Cannot reject normality	
T-Test For Difference Between Mean and Value Section				
Alternative Hypothesis	T-Value	Prob Level	Reject H0 at .050	Power (Alpha=.05)
Due to competition ≤ 3	0.179	0.85863	No	0.05359
Due to competition < 3	0.179	0.57069	No	0.03422
Due to competition > 3	0.179	0.42931	No	0.07111

Due to the low number of respondents who perceived that IMR retail tariffs had reduced in the last three years, it was decided to test whether the mean for “due

to competition” is greater than the scale midpoint 3. Table 26 shows that the mean for the item IMR retail tariffs reduced “due to competition” is the same as the scale midpoint of 3 (mean of 3.0; $t(89) = 0.18$; $p > 0.05$).

5.9. Research Question 4

Will there be an increase in usage of international mobile roaming if the tariff is reduced?

Descriptive statistics in the form of graphs and tables are used to show respondent perceptions of whether international mobile roaming (IMR) usage will increase if the tariff is reduced substantially, or if the tariff is similar to the home tariff for a similar call.

5.9.1. Descriptive statistics on perceptions about IMR demand elasticity

Most of the respondents (88%) agreed that they will use international mobile roaming (IMR) more frequently if the tariff is reduced substantially (Figure 23).

Figure 24 shows that 84% of respondents agreed that they will use IMR more frequently if the tariff is similar to the home tariff for a similar call.

Figure 23: Perceptions of whether IMR usage will increase at lower tariff

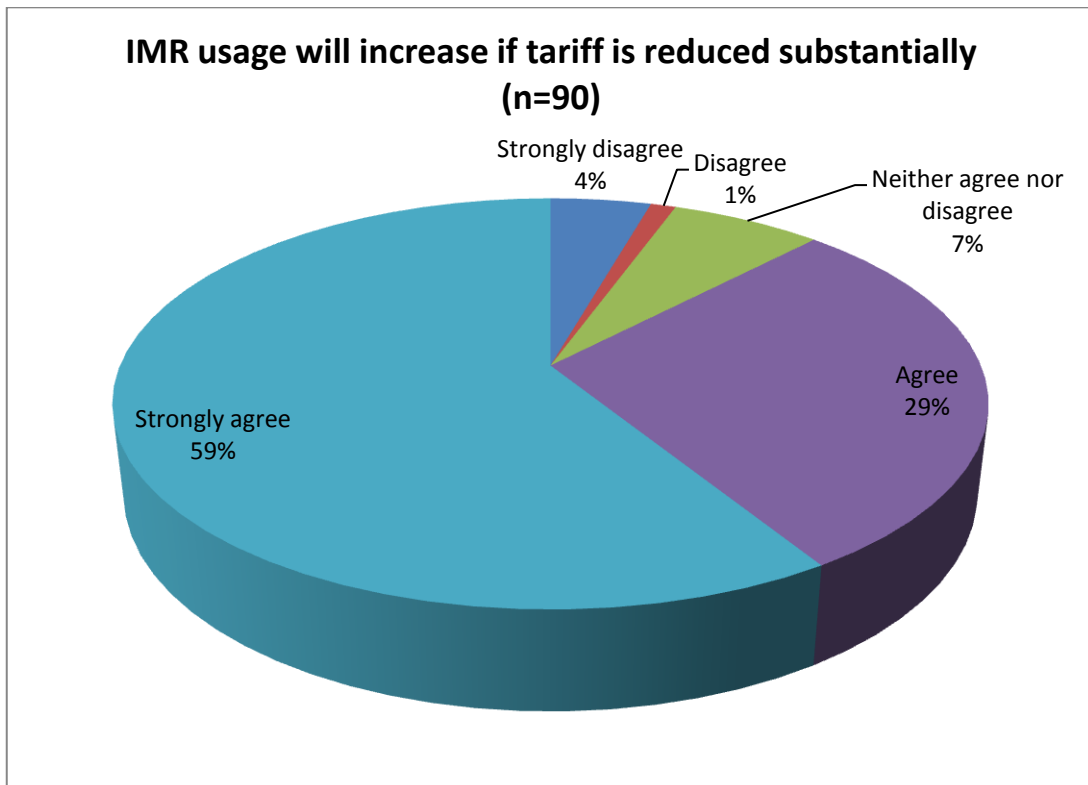
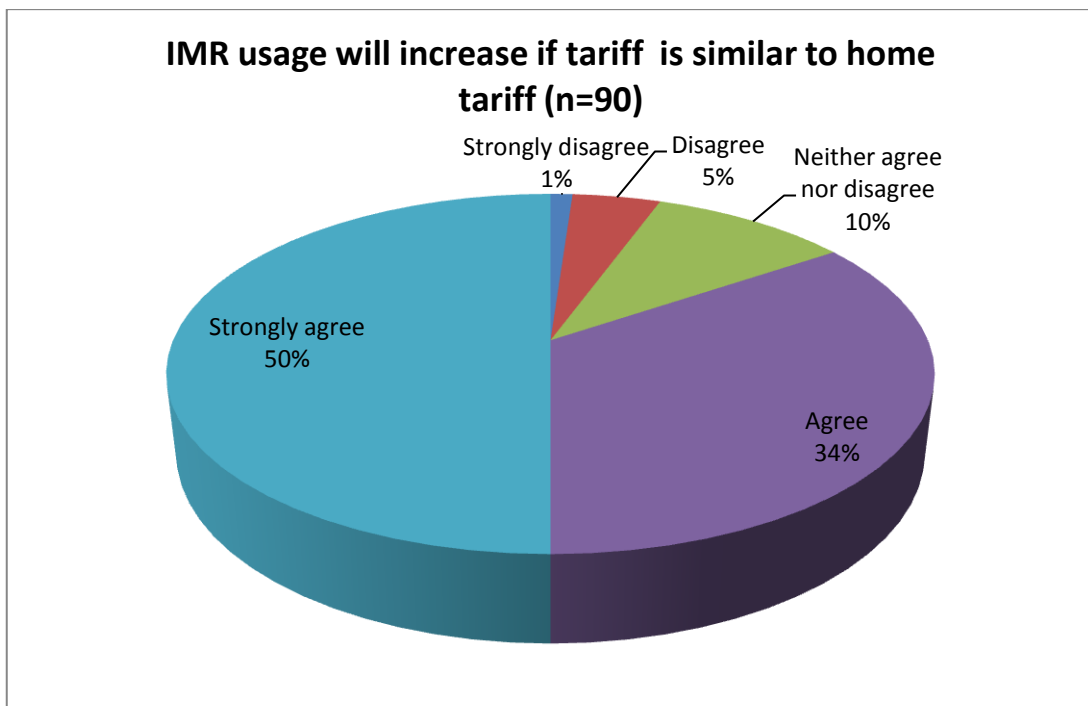


Figure 24: Perceptions of whether IMR usage will increase if tariff is similar to home tariff



5.9.2. Hypothesis 5

The mean of the item IMR usage will increase if “the tariff is reduced substantially” is much greater than the scale midpoint of 3 (mean of 4.4; $t(89)=13.12$; $p=0.0$) as seen in Table 27. Similarly, mean of the item IMR usage will increase if “IMR tariff similar to home tariff” is much greater than the scale midpoint of 3 (mean of 4.3; $t(89)=13.47$; $p=0.0$).

Table 27: Test of demand elasticity for IMR usage

Test of means against reference constant (value)								
	Mean	Std. Dev.	N	Std. Err.	Reference Constant	t-value	df	p
the tariff is reduced substantially	4.4	0.99	90	0.10	3.0	13.121	89	0.0
IMR tariff similar to home tariff	4.3	0.90	90	0.09	3.0	13.472	89	0.0

Note: Extracted from appendix 7.8

5.10. Research Question 5

Will regulatory intervention reduce competition?

Descriptive statistics in the form of graphs and tables are used to show respondent perceptions of whether regulatory intervention will reduce competition, as measured by the number of mobile operators in a country.

5.10.1. Descriptive statistics on perceptions about whether regulation will reduce competition

Most of the respondents (82%) disagreed with the statement that their home mobile network operator (MNO) will be forced out of business if its international mobile roaming (IMR) retail tariffs are regulated (Figure 25).

Figure 25: Perceptions of whether IMR retail tariff regulation will decrease competition

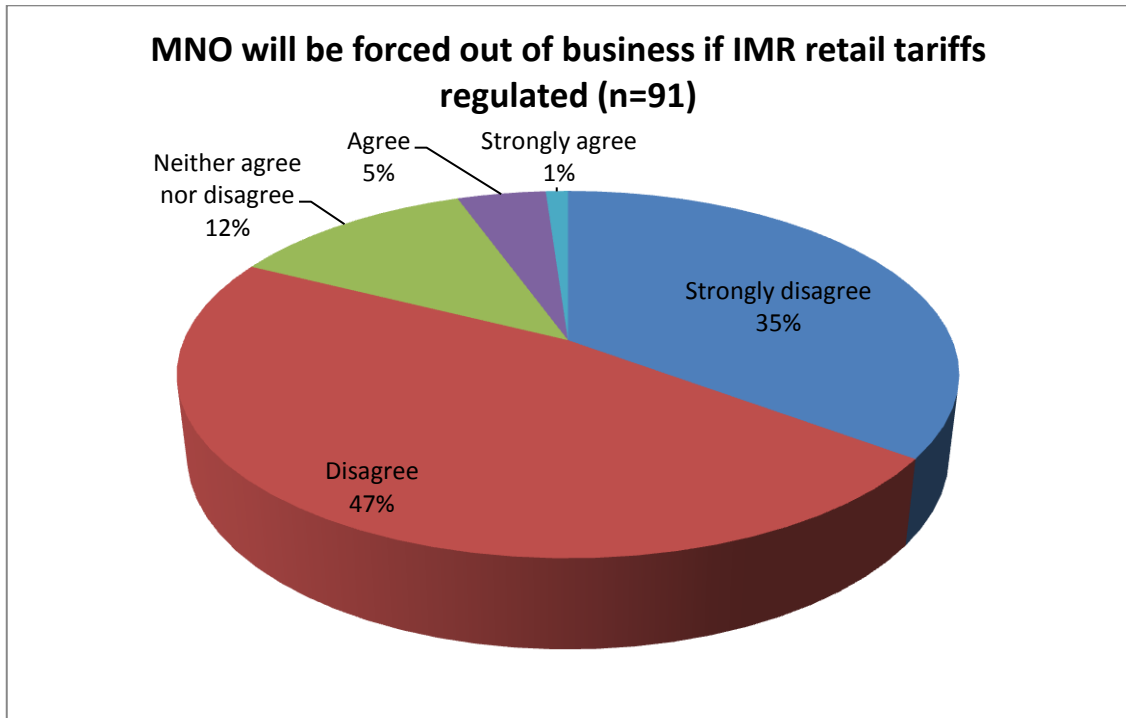


Figure 26: Perceptions of whether tariff transparency measures will decrease competition

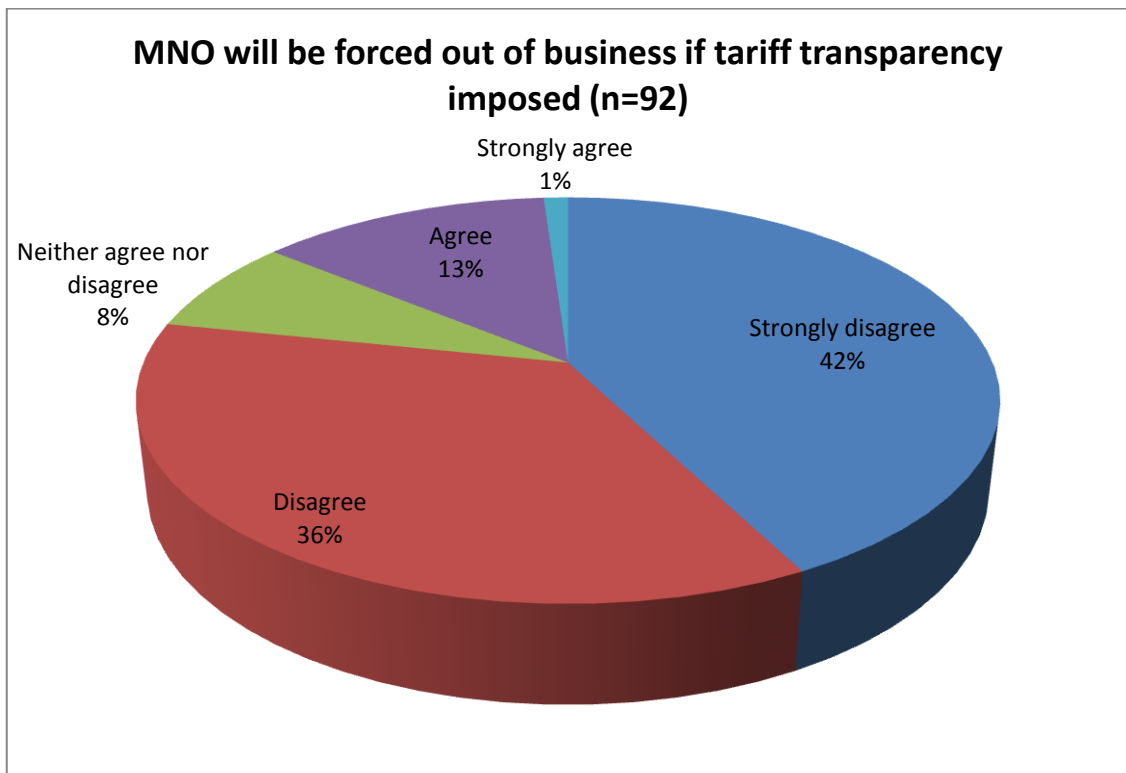


Figure 26 shows that more than three-quarters (78%) of respondents disagreed with the statement that the imposition of tariff transparency measures will force their home MNO out of business.

5.10.2. Hypothesis 6

Table 28 indicates that all foreseen types of regulatory intervention – “tariff regulation” (mean of 1.9; $t(90) = -12.28$; $p = 0.0$), “transparency measures” (mean of 1.9; $t(91) = -9.52$; $p = 0.0$), and “cut off after pre-determined limit” (mean of 2.2; $t(90) = -7.07$; $p = 0.0$) have means which are much less than the scale midpoint 3.

Table 28: T-test result –regulatory intervention reduces competition

Test of means against reference constant (value)								
	Mean	Std. Dev.	N	Std. Err.	Ref. Const	t-value	df	p
its IMR retail tariffs are regulated.	1.9	0.86	91	0.09	3.0	-12.280	90	0.0
it has to implement tariff transparency measures such as free SMS showing IMR tariff when I enter another SADC country.	1.9	1.06	92	0.11	3.0	-9.518	91	0.0
it has to cut off international mobile roaming whenever I reach a pre-determined monetary limit e.g. USD100.	2.2	1.11	91	0.12	3.0	-7.074	90	0.0

Note: Extracted from appendix 7.9

The results presented in this chapter show the findings that were drawn from the analysis of the responses to the survey questionnaire. Chapter six will provide a discussion of the results.

6. DISCUSSION OF RESULTS

This chapter will discuss the results that were presented in chapter 5 in relation to the research problem from chapter 1, literature review from chapter 2 and the hypotheses from chapter 3. The research questions that were presented in chapter 3 are used as major headings, with the associated propositions and hypotheses following in logical order. The main discussion is preceded by a discussion of the significance level which is used for hypothesis testing, as well as the implications of the demographics of respondents.

6.1. Significance level

Throughout the analysis, a 5% level of significance ($\alpha = 0.05$) was applied as the most lenient or least stringent level for tests of hypotheses. Diamantopoulos and Schlegelmilch (2000) explained that the significance level (α) in hypothesis testing is the maximum risk one is willing to take in rejecting a true null hypothesis. They explained further that if the value obtained in our statistical test has a probability of occurrence less than or equal to the significance level, we reject the null hypothesis in favour of the alternative hypothesis and declare the test result as significant. If the probability is greater than the significance level then we cannot reject the null hypothesis and the test result is non-significant.

6.2. Demographic data

Almost two-thirds (61%) of the respondents were from South Africa (Table 14), which is not surprising when one considers that South Africa accounts for 42% of the mobile subscribers, 41% of the internet users (ITU, 2010b) and 46% of cross border travellers in the region (Analysys Mason, 2010).

Three-quarters (75%) of respondents were on post paid/ contract cellular packages and 24% on prepaid packages (Figure 11). This makes the sample non representative of the population since more than 88% of all mobile subscribers in Africa are on prepaid packages (Informa, 2008 and Wireless Intelligence, 2010).

Different categories of roamers

The reviewed literature (Analysis Mason, 2010; OECD, 2009; ITU, 2008; Informa, 2008 & 2010) identified two distinct categories of roaming subscribers – business travellers with inelastic demand and cost conscious consumer or leisure travellers. Cluster analysis of the roaming preferences of respondents confirmed the presence of two distinct groups (appendix 7.1.1), which the author labelled Big spenders and Cost conscious. Unfortunately, the demographic and home mobile usage profiles of these two groups (Figure 13) were poor predictors of their roaming usage.

Informa (2010) defined business travellers as those individuals whose mobile cellular account was paid for by their companies, while consumer or leisure travellers paid for their cellular usage themselves. This definition is easy to replicate and was therefore used to separate the respondents into two groups – Business and Consumer, which have similar roaming usage patterns to the calculated Big spender and Cost conscious clusters (appendix 7.1.1).

In this study the consumer group (n=50) is larger than the business group (n=43), which supports the claims made by Informa (2010) and Analysis Mason (2010) that the majority of cross border roamers in Africa and SADC are consumers (non business users).

6.3. Research Question 1

This section examines the level of usage of international mobile roaming (IMR) by cross border travellers, with specific emphasis on the differences between business and consumer travellers.

The usage of international mobile roaming (IMR) by the entire sample is examined first, then later by the two groups – business and consumer travellers.

6.3.1. Descriptive statistics of overall IMR usage

Informa (2008 & 2010) and Analysis Mason (2010) highlighted that roaming usage is low in Africa. Figure 14 supports these claims since 18% of respondents switch off their phones while visiting another country and do not roam, while another 22% only send SMS/text messages in an effort to control costs.

Statistical test

The NCSS statistical package was used to perform a one sample t-test on the variables relating to IMR usage i.e. voice, SMS and data, to determine whether they experience frequent usage. The scale midpoint of 3.0 was used as the reference constant. Mean values significantly greater than 3.0 would indicate frequent usage while mean values significantly less than 3.0 would indicate infrequent usage.

Test result

Table 17 shows that at the 5% level of significance cross border travellers use SMS/text messages frequently (mean of 3.9; $p < 0.05$), while mobile data is

infrequently used (mean of 2.4; $p < 0.05$). Although the mean value of roaming voice calls (3.3) is greater than the scale midpoint 3, the high p-value of 0.11 ($p > 0.05$) implies that the null hypothesis cannot be rejected. This means that the finding that roaming voice is used frequently (mean > 3.0) is not significant. This finding is in line with the predictions of Informa (2010), Sutherland (2010a) and Analysis Mason (2010) that SADC travellers display low usage of international mobile roaming.

6.3.2. Hypothesis 1

Null hypothesis (H_0):

The frequency of using international mobile roaming (IMR) is the same for business and consumer cross border visitors.

Alternative hypothesis (H_A):

The frequency of using international mobile roaming (IMR) is higher for business than for consumer cross border visitors.

Statistical test

The data was split into two groups, business and consumer cross border visitors, as explained in section 5.5.2. Thereafter the IMR usage of the two groups was compared. The NCSS statistical package was used to perform a t-test for independent groups on the variables relating to IMR usage i.e. voice, SMS and data.

The null hypothesised mean difference between the frequency of using international mobile roaming by business and consumer cross border visitors (business – consumer) was zero or less than zero. Mean difference values

significantly greater than zero would indicate that the frequency of using IMR is higher for business than for consumer cross border travellers. Mean difference values significantly less than zero would indicate that the frequency of using IMR is lower for business than for consumer cross border travellers.

Test result

Table 18 shows that the mean differences for voice, SMS and data are all significantly greater than zero at the 5% level of significance, therefore the null hypothesis can be rejected. This implies that business travellers use roaming voice, SMS and data more frequently than do consumer travellers.

This result confirms the existence of two distinct groups of cross border visitors with different roaming habits, as proposed by OECD (2009), Analysis Mason (2010), ITU (2008), Informa (2008) and Informa (2010). It also shows that for voice roaming calls the opposing usage patterns of the two groups, with high usage by business (mean = 3.9) and low usage by consumer (mean = 2.7) travellers, cancel each other (mean Total = 3.3 and $p = 0.11$).

The low uptake of data roaming by business and consumer travellers, as shown in Table 18, confirms the statement made by Analysis Mason (2010) that data roaming in the SADC region is still in its infancy since several operators have not yet deployed packet switched data technologies such as GPRS or EDGE, while billing challenges remain. The GSM Association (2010) describes GPRS (General Packet Radio Service) as a very widely deployed wireless data service for GSM networks with throughput rates of up to 40 kbit/s. It further explains that Enhanced Data rates for GSM Evolution (EDGE) technology provides up to three times the data capacity of GPRS.

Mobile network operators (MNOs) in SADC have traditionally focused on business travellers (Informa, 2010) by providing roaming services to post paid subscribers (Analysis Mason, 2010). The requirement for private subscribers to pay a deposit before roaming and the limited availability of prepaid and data roaming are some impediments which constrain roaming uptake (Analysis Mason, 2010). MNOs should increase the number of potential outbound roamers by removing these impediments through reducing or eliminating the deposit and extending their footprint for prepaid and data roaming – possibly through joining a roaming hub.

ITU (2008) argues that due to the low fixed telephony penetration rate and high mobile penetration, many Africans will access the Internet via mobile technology. MNOs can help their countries to increase internet penetration by building high speed mobile data networks to serve their domestic customers, while enjoying increased revenues from inbound roamers who use the data network.

Analysis Mason (2010) and Sutherland (2010a) argued that the majority of African cross border travellers switched off their phones and did not roam, while Figure 14 shows that 18% of respondents switched off their phones and did not roam. Although less than predicted, it is still a high number of respondents who did not roam. In order to increase roaming uptake MNOs should try to understand and address the reasons why cross border travellers do not use their phones to roam.

6.4. Research Question 2

This section examines the usage level of alternative communication methods (ACM) by cross border travellers, with specific emphasis on the differences between business and consumer travellers.

Various authors identified some alternative communication methods that may be used in place of international mobile roaming, such as - purchase of a local SIM card and engage in “plastic roaming” (Analysis Mason, 2010; Sutherland, 2010a; OECD, 2010; ITU, 2008); use of calling cards to make international calls back home; use of the Internet to make voice over internet protocol calls e.g. via Skype; and other internet based communications (Analysis Mason, 2010).

The usage of alternative communication methods (ACM) by the entire sample is examined first, then later by the two groups – business and consumer travellers.

6.4.1. Descriptive statistics of overall ACM usage

OECD (2010) and ITU (2008) argued that alternative communication methods (ACM) are not consumer friendly and consequently suffer from low uptake. This argument is supported by the results depicted in Figure 16, which shows that more than half of respondents (53%) used their home SIM card to roam instead of using alternative communication methods. Respondents did not prefer any of the alternative communication methods instead of using their home SIM card to roam as depicted by the high percentage that rejected the various ACMs e.g. local SIM card (67%), hotel phone (64%), public phone (65%) and internet telephony (53%).

A high percentage in Figure 16 indicates low preference for that alternative communication method since it is rejected by a large percentage of

respondents, while a low percentage indicates a low rejection rate for the ACM in relation to roaming with the home SIM card.

Statistical test

The NCSS statistical package was used to perform a one sample t-test in order to verify whether respondents preferred to engage in international mobile roaming (IMR) instead of using the various types of alternative communication methods. The scale midpoint of 3.0 was used as the reference constant. Mean values significantly greater than 3.0 would indicate a preference for roaming over the alternative communication method, while mean values significantly less than 3.0 would indicate a preference for the alternative communication method over roaming.

Test result

No conclusion could be drawn with respect to the usage of IMR relative to Internet telephony, call back services, hotel phone and other communication methods since the results were not significant at the 5% significance level ($p > 0.05$) (Table 19).

Table 19 demonstrates that at the 5% significance level international mobile roaming is preferred relative to the use of a local SIM card (plastic roaming) (mean of 3.4; $p < 0.05$), use of a public payphone (mean of 3.4; $p < 0.05$), and use of a local calling card (mean of 3.3, $p < 0.05$). These results imply that respondents do not bother to use alternative communication methods such as a local SIM card, a public phone and local calling card from the visited country.

Although SMS using the home SIM is not strictly an alternative communication method, it was tested relative to voice roaming to help determine the elasticity of demand. The test result for this item (mean of 2.6; $p < 0.05$) indicates that the mean is significantly less than the scale midpoint 3, which implies that respondents preferred to send SMS instead of engaging in voice roaming.

6.4.2. Hypothesis 2

Null hypothesis (H_0):

The frequency of using international mobile roaming (IMR) relative to alternative communication methods (ACM) is the same for business and consumer cross border visitors.

Alternative hypothesis (H_A):

The frequency of using international mobile roaming (IMR) relative to alternative communication methods (ACM) is higher for business than for consumer cross border visitors.

Statistical test

The data was split into two groups, business and consumer cross border visitors, as explained in section 5.5.2. Thereafter the usage of IMR relative to ACM of the two groups was compared. The NCSS statistical package was used to perform a t-test for independent groups on the variables relating to IMR usage relative to ACM. The ACM variables were - send SMS instead of making voice calls, local SIM card, hotel phone, public phone, local calling card, call back services, Internet telephony and other communication methods.

The null hypothesised mean difference between the frequency of using international mobile roaming (IMR) relative to alternative communication methods (ACM) by business and consumer cross border visitors (business – consumer) was zero. Mean difference values significantly greater than zero would indicate that the frequency of using IMR relative to alternative communication methods (ACM) is higher for business than for consumer cross border travellers. Mean difference values significantly less than zero would indicate that the frequency of using IMR relative to alternative communication methods (ACM) is lower for business than for consumer cross border travellers.

Test result

All tests were performed using a 5% significance level. Figure 17 and Table 20 show that “SMS instead of voice” is the only item for which consumer cross border visitors display significantly higher usage of alternative communication methods relative to IMR, than business travellers (mean consumer = 2.9; mean business = 2.3; $p < 0.05$).

Figure 17 and Table 20 also show that for all other items tested, the frequency of using international mobile roaming (IMR) relative to alternative communication methods (ACM) is significantly higher for business than for consumer cross border visitors (mean business > mean consumer; $p < 0.05$).

The higher usage of roaming SMS by consumer relative to business travellers, which is less expensive than voice as seen in Appendix 2, confirms that consumer travellers are more price sensitive. This is in line with the view of some regulatory authorities that are examining regulation of international mobile

roaming, that international mobile roaming has elastic demand (CEC, 2008; ITU, 2008; Sutherland, 2010a).

The preference of business travellers to use international mobile roaming instead of alternative calling methods reinforces the view held by some mobile network operators (MNOs) that the demand for roaming is inelastic (CEC, 2008; ITU, 2008; Sutherland, 2010a; Analysis Mason, 2010; Informa, 2010). This view is supported by the refusal of business users to consider alternative communication methods, despite the relatively high IMR average retail tariff of USD 3.05 per minute in Africa (Informa, 2008) and USD 1.90 per minute in SADC (Analysis Mason, 2010).

The finding that international mobile roaming is preferred to alternatives such as switching to a local SIM card, use of a public payphone and use of a local calling card point to the lack of convenient alternatives to roaming. This finding can make policy makers and regulators more determined to regulate the tariffs of IMR if the MNOs do not take action to reduce them from the current high levels.

The low uptake of Internet telephony could be attributed to the low broadband penetration in the SADC region (ITU, 2010b). This limits the number of people who can make or receive calls over Skype, or similar voice over internet protocol (VoIP) technology, to those few individuals who have broadband internet access.

6.5. Research Question 3

This section examines how respondents perceive the level of international mobile roaming (IMR) retail tariffs relative to domestic tariffs, and their perceptions of whether IMR tariffs have decreased in recent years.

6.5.1. Descriptive statistics on perceptions about level of IMR tariffs

Figure 18 shows that 72% of respondents agreed that the tariff of a local call is higher when roaming than at home, while 67% agreed that the tariff of an international call is higher when roaming than at home (Figure 19). These findings concur with the author's findings that for a South African mobile subscriber who is roaming in India, the tariff of roaming local and international calls are far higher than the tariff of equivalent calls for a local Indian subscriber (Table 1).

6.5.2. Hypothesis 3

Null hypothesis (H_0):

Respondents perceive that international mobile roaming (IMR) retail tariffs have not reduced in the last three years.

Alternative hypothesis (H_A):

Respondents perceive that international mobile roaming (IMR) retail tariffs have reduced in the last three years.

Statistical test

The data was split into two groups, business and consumer cross border visitors, as explained in section 5.5.2. Thereafter the perceptions of the two

groups were tested to determine if they perceived that IMR retail tariffs have reduced. The NCSS statistical package was used to perform a t-test. The scale midpoint of 3.0 was used as the reference constant. Mean values significantly greater than 3.0 would indicate the perception that IMR retail tariffs have reduced while mean values significantly less than 3.0 would indicate the perception that IMR retail tariffs have not reduced. All tests were performed using a 5% significance level.

Test result

The results shown in Table 21 indicate that for both consumer and business travellers the mean value of the item “IMR retail tariff has reduced in the last three years” is not significantly equal to or less than the scale midpoint 3.0 (mean consumer of 2.8; $p>0.05$, and mean business of 3.0; $p>0.05$). The null hypothesis cannot be rejected, which implies that both groups perceive that IMR retail tariffs have not reduced in the last three years.

An area of concern is that almost half of the respondents (44%) did not express an opinion (neither agree nor disagree) on the statement that international mobile roaming tariffs have reduced in the last three years (Figure 20). This finding supports the argument made by Analysis Mason (2010) that only 29% of MNOs in SADC publish their retail roaming tariffs. The author also found it extremely difficult to find details of the IMR tariffs on operator websites, with the exception of the three South African MNOs (Vodacom, MTN and Cell C). While Cell C published their IMR retail tariffs for India, as seen in appendix 2, it is very detailed and unnecessarily complicated with separate tariffs listed for approximately 50 networks. Many of the tariffs are identical and Cell C should

consider having a limited number of tariffs for India (one or two), similar to Vodacom and MTN.

The large number of respondents (44%) who are unsure whether IMR retail tariffs reduced in the last three years suggests that these respondents either do not know the tariff for international mobile roaming e.g. consumer and business travellers, or do not care e.g. business travellers. The consumer travellers may have stopped roaming, probably due to their perceptions of high tariffs, or a previous bad experience such as bill shock. Several authors (Analysis Mason, 2010; ITU, 2008; OECD, 2010) stressed the need for transparency measures to be introduced in order to inform consumers about roaming charges and to avoid bill-shock. These transparency measures are urgently needed in order to allay the fears of the cost conscious travellers and make them understand that roaming may not be as expensive as they think, and that they can control their roaming expenditure.

6.5.3. Hypothesis 4

Null hypothesis (H_0):

Respondents perceive that competition did not play a greater role than regulatory intervention (regulation) in reducing international mobile roaming (IMR) retail tariffs.

Alternative hypothesis (H_A):

Respondents perceive that competition played a greater role than regulatory intervention (regulation) in reducing international mobile roaming (IMR) retail tariffs.

Statistical test

The NCSS statistical package was used to perform a t-test for dependent samples on the variables “competition” and “regulation” (as the reason for a reduction in IMR retail tariff).

The null hypothesised mean difference between competition and regulation (competition – regulation) as the reason for a reduction in IMR retail tariff was zero. Mean difference values significantly greater than zero would indicate that competition played a greater role than regulation in reducing international mobile roaming (IMR) retail tariffs. Mean difference values significantly less than zero would indicate that regulation played a greater role than competition in reducing international mobile roaming (IMR) retail tariffs. All tests were performed using a 5% significance level.

Test result

Table 25 indicates that the mean of competition was significantly larger than that of regulatory intervention (mean difference of 0.4; $p < 0.05$), therefore the null hypothesis can be rejected. This implies that respondents perceived that competition played a greater role than regulatory intervention in reducing IMR retail tariffs within the last three years.

This finding should however be viewed with caution since Table 26 indicates that in respondents’ perception, competition did not cause a reduction in IMR retail tariffs (mean of 3.0; $p > 0.05$). Additionally, according to Figure 20, Table 21 and hypothesis 3 in section 6.5.2, respondents did not perceive that IMR retail tariffs have reduced in the last three years.

The finding suggests that although competition is more important than regulation in reducing international mobile roaming retail tariffs, it is not sufficient on its own. Gillwald and Mureithi (2010) made this observation when they stated that the Zain One Network elimination of IMR retail tariffs for roaming between African countries where it operates, and the competitor responses, indicates that it is important to create the right policy and regulatory framework for competition to flourish and innovate (Gillwald & Mureithi, 2010).

MTN's IMR retail tariffs applicable to its South African subscribers, as seen in appendix 2, demonstrates that an enabling regulatory framework without competition does not yield high total welfare. South Africa's international gateway market was liberalised on 1 February 2005 (Minister of Communications, 2004), but due to a lack of competition in the IMR retail market MTN and the other South African MNOs can continue to charge an IMR retail tariff that is higher than the domestic tariff for a similar call. This is in stark contrast to the situation in East Africa where MTN and Vodacom were forced to remove the roaming surcharge as a competitive response to the Zain One Network when their subscribers travelled among Tanzania, Kenya and Uganda.

MTN is not alone in the way it does not afford its SADC subscribers the same benefits as its East African subscribers. Orange and Vodafone are two mobile network operator groups that are headquartered in Europe and have substantial operations in Africa. There is nothing to stop Orange and Vodafone giving African customers a secondary IMSI from one of their European networks to allow them access to regulated roaming rates (Sutherland, 2010). Although there is no regulatory requirement for the Orange and Vodafone to extend the benefits of the lower Euro-tariff to African subscribers, robust competition

should have seen this introduced as a subscriber retention or differentiating mechanism.

It appears that the East African model of robust competition, underpinned by an enabling regulatory framework, provides the largest increase in total welfare.

6.6. Research Question 4

This section examines the elasticity of demand for the international mobile roaming (IMR) service, based on respondent perceptions.

6.6.1. Descriptive statistics on perceptions about IMR demand elasticity

Figure 23 shows that 88% of respondents agreed that they will use international mobile roaming more frequently if the tariff is reduced substantially, while 84% agreed that they will use IMR more frequently if the tariff is similar to the home tariff for a similar call (Figure 24). These findings imply that IMR usage is currently low in SADC (Analysis Mason, 2010) due to the high tariffs.

6.6.2. Hypothesis 5

Null hypothesis (H_0):

Respondents perceive that international mobile roaming (IMR) usage does not increase when the retail tariff is reduced (TR).

Alternative hypothesis (H_A):

Respondents perceive that international mobile roaming (IMR) usage increases when the retail tariff is reduced (TR).

Statistical test

The NCSS statistical package was used to perform a t-test. The scale midpoint of 3.0 was used as the reference constant. Mean values significantly greater than 3.0 would indicate the perception that IMR usage increases when the retail tariff is reduced, while mean values significantly less than 3.0 would indicate the perception that IMR usage does not increase when the retail tariff is reduced. All tests were performed using a 5% significance level.

Test result

The results in Table 27 show that the mean value of the items “IMR usage will increase if tariff is reduced substantially” (mean of 4.4; $p < 0.05$) and “IMR tariff similar to home tariff” (mean of 4.3; $p < 0.05$) are significantly greater than the scale midpoint 3.0. The null hypothesis can therefore be rejected, which implies that respondents perceive that there will be a large increase in usage of international mobile roaming if the tariff is reduced substantially or if the IMR tariff is similar to the home tariff.

This finding supports the statement made by GSM Association that the elasticity of demand for mobile service is higher in Africa than elsewhere (ITU, 2008). In this instance the GSM Association is in agreement with the European Union regulator that the demand for international mobile roaming is elastic (CEC, 2008). It also supports the observation made by GSMA (2008a) that in 2007 MTN Uganda saw the number of its roaming subscribers increase seven fold within one month of the introduction of its competitive response to the launch of the Zain One Network in East Africa.

Informa (2010) summarised the issue well when it said that operators have their destiny in their own hands in relation to the regulation of international mobile roaming. They can reduce tariffs and stimulate IMR uptake thus staving off regulation and increasing profits, or they can delay as European operators did and face possibly draconian regulation (Informa, 2010) along with the attendant bad publicity.

6.7. Research Question 5

This section examines whether respondents perceive that regulatory intervention will reduce competition as measured by the number of mobile network operators.

6.7.1. Descriptive statistics on perceptions about whether regulation will reduce competition

Figure 25 shows that 82% of respondents disagreed with the statement that their home mobile network operator will be forced out of business if its international mobile roaming retail tariffs are regulated. A similarly large percentage (78%) disagreed that the imposition of tariff transparency measures will force their home MNO out of business (Figure 26). These findings imply that respondents are in agreement with the SADC Ministers (2010) that regulation of international mobile roaming (IMR) will yield positive benefits to society.

6.7.2. Hypothesis 6

Null hypothesis (H₀):

Respondents perceive that regulatory intervention (RI) reduces the number of mobile network operators.

Alternative hypothesis (H_A):

Respondents perceive that regulatory intervention (RI) does not reduce the number of mobile network operators.

Statistical test

The NCSS statistical package was used to perform a t-test. The scale midpoint of 3.0 was used as the reference constant. Mean values significantly less than 3.0 would indicate the perception that regulatory intervention (RI) does not reduce the number of mobile network operators, while mean values significantly greater than 3.0 would indicate the perception that regulatory intervention (RI) reduces the number of mobile network operators. All tests were performed using a 5% significance level.

Test result

The results in Table 28 show that the mean of the items representing the various types of regulatory intervention are all significantly less than the scale midpoint 3.0 (mean values range from 1.9 to 2.2; $p < 0.05$, $n > 90$). The null hypothesis can therefore be rejected, which implies that respondents perceive that regulatory intervention (RI) does not reduce the number of mobile network operators.

This finding is in line with Smith (2010) who argues that the number of mobile network operators is stable in developed markets, such as Europe which is subject to regulation of international mobile roaming, while it is increasing in developing markets such as SADC. Since international mobile roaming accounts for a relatively small part of an operator's total revenue (Analysis

Mason, 2010), it is unlikely that any reduction in IMR revenues will cause any operator to exit the market.

6.8. Summary

The study was framed via hypotheses, which were then tested using a 5% significance level. Hypothesis 1 established that there are two distinct groups of cross border travellers, with the business travellers displaying more frequent usage of international mobile roaming than consumer travellers.

Hypothesis 2 established that as expected the usage of alternative communication methods (ACM) was low, while business travellers displayed a higher preference for using international mobile roaming relative to ACM. SMS was the exception where consumer travellers preferred to use it more than regular international mobile roaming voice calls.

The null hypothesis 3 was not rejected, which implies that respondents perceived that international mobile roaming retail tariffs have not reduced in the last three years. This unexpected result was probably due to almost half of the respondents not expressing an opinion.

Hypothesis 4 suggested that competition played a greater role than regulatory intervention in reducing international mobile roaming retail tariffs. While expected, this result should be treated with caution since in hypothesis 3 respondents indicated that IMR retail tariffs have not reduced in the last three years.

As expected, hypothesis 5 established that respondents perceive there will be a large increase in usage of international mobile roaming if the tariff is reduced

substantially. This suggests that the demand for international mobile roaming is elastic.

Hypothesis 6 established that respondents perceived there will be no reduction in the number of mobile network operators as a result of regulatory intervention.

The next chapter presents the conclusion, recommendations to stakeholders and recommendations for further study.

7. CONCLUSION

There are high numbers of travellers among SADC countries due to trade, language and cultural ties. Many of these cross border travellers use mobile cellular services at home but the uptake of international mobile roaming is disappointingly low.

This research project set out to answer the question - *“Has competition delivered increased welfare to both operators and consumers or is it time to regulate international mobile roaming in the SADC region?”*

In order to answer this question the research project investigated the existence of two distinct groups of cross border travellers and the level of usage of international mobile roaming (IMR) and alternative communication methods (ACM) by these two groups. It also explored perceptions about the level of IMR tariffs, demand elasticity of IMR, whether competition played a greater role than regulation in reducing IMR tariffs and whether regulation reduced competition.

7.1. Main findings of the study

This study found that mobile cellular subscribers were careful with their roaming usage if they paid for it themselves, but were less so when the company paid for their cellular usage. The perception of high international mobile roaming (IMR) retail tariffs, along with the high percentage of price sensitive prepaid mobile subscribers in SADC, explains the low roaming uptake in the region.

Many respondents did not know whether IMR retail tariffs had reduced in the last three years, possible due to the absence of tariff information or the presence of overly complicated tariffs from their mobile network operator

(MNO). The decision by the SADC Ministers responsible for ICT to impose tariff transparency measures on MNOs is therefore a welcome step in removing this obstacle to roaming. It will allow mobile subscribers to know in advance how much they will pay for a roaming event and help to prevent bill shock.

Although it was found that competition played a greater role than regulation in reducing IMR retail tariffs, this should be viewed with caution since the perception is that IMR retail tariffs have not reduced in the last three years. It was found that robust competition underpinned by an enabling regulatory framework yielded the greatest welfare benefit to society. Today African travellers that fall within the Zain One Network footprint enjoy substantial savings when roaming, while Zain and its competitors experienced at least a seven fold increase in the number of roamers. This has resulted in increased consumer welfare and producer profits, pointing to increased total welfare due to the removal of the roaming surcharge.

The large mobile network operator groups and alliances have managed to internalise roaming traffic, thereby reducing their wholesale costs. These cost reductions have not been passed on to customers or to MNOs that are not part of these alliances, resulting in stubbornly high retail tariffs. The wholesale international mobile roaming market is possibly anticompetitive, with the smaller MNOs being unable to compete with the large groups and alliances.

Mobile network Operators in the SADC region have their destiny in their own hands – they can work together to reduce tariffs and stimulate IMR uptake thus staving off regulation as demonstrated in East Africa, or delay as European operators did and face possibly draconian regulation.

7.2. Recommendations to stakeholders

Mobile network operators in SADC are encouraged to implement drastic reductions to, or remove altogether, the surcharge on international mobile roaming. Developments in East Africa have shown the superiority of this approach relative to the regulatory intervention that was imposed in Europe. Both consumers and producers (MNOs) benefited, resulting in increased social welfare. Failure to take this action will eventually result in regulation being imposed.

Policy makers and regulators in the SADC region are encouraged to impose tariff transparency measures immediately and to publish their expectations with respect to IMR in a statement of intent (Analysis Mason, 2010). The tariff transparency measures will protect consumers from bill shock, while the statement of intent will signal to MNOs what they can expect if there is no significant reduction in IMR retail tariffs. All regulatory barriers, such as monopoly on international gateway, should be removed in order to create an enabling environment for competition to prosper.

Organised consumer advocacy groups have been notable by their absence during the various regulatory debates and initiatives in South Africa and SADC. Communication users need to organise themselves into advocacy groups that will represent the interests of both small and large users when regulatory intervention is being considered. The European telecommunication user group was instrumental in gathering information about international mobile roaming tariffs, lodging complaints with regulatory authorities and participating in the development of the final regulation. SADC users need to be similarly organised.

7.3. Recommendations for further research

Opportunities exist to conduct further research in the following areas:

- Investigate the characteristics of the two groups of roamers. Policy makers and MNOs can better serve the roaming needs of cross border visitors if they understand these needs.
- Investigate the reasons why there is no competitive wholesale market for international mobile roaming, similar to those for international voice telephony and internet traffic.

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APPENDIX 1: Vodafone Essar prepaid tariffs – Mumbai, India


To activate your Vodafone Prepaid card, you only need to pay a nominal start-up cost of Rs 49

Tariff Plans	Base tariff
MRP (Rs)	49
Applicability	New Customers
Initial Talktime	nil
SIM Card Validity	Lifelong
Local call rates	
Vodafone-to-Vodafone calls	Rs 1/ min
Vodafone - Other Mobiles	Rs 1/ min
To Landlines	Rs 1/ min
STD call rates	
	Rs / min
Vodafone-to-Vodafone calls	Rs 1.5/min
Vodafone - Other Mobiles	Rs 1.5/min
To Landlines	Rs 1.5/min
ISD call rates	
	Rs / min
USA & Canada; SE Asia; Landline numbers in Australia, New Zealand, UK, Germany & France (excluding premium destinations)	Rs 6.4
<u>SAARC</u> : China, Russia, Egypt, South Africa, Kenya, Nigeria, Japan, South Korea, Mobile numbers in Australia, UK, Germany & France (excluding premium destinations)	Rs 10
Middle East including UAE and Saudi Arabia excluding Oman	Rs 11
Oman (excluding premium destinations)	Rs 15
Afghanistan. Mobile numbers in New Zealand, Italy, Netherlands, Switzerland, Rest of Europe, Rest of Africa, Rest of World (excluding premium destinations)	Rs 15
Egypt, Maldives, Bulgaria, Pacific Rim Countries, North Korea, Specific destinations in Africa & Europe (excluding premium destinations)	Rs 45
Premium Destinations	Rs 100
Satellite Calls	Rs 500
SMS	
Local SMS	Rs 1
National SMS	Rs 1.5
International SMS	Rs 5

Source: Vodafone India website www.vodafone.in, accessed 18 October 2010

APPENDIX 2: Tariffs for South Africans roaming in India

VODACOM




DON'T SAY GOODBYE. SAY HELLO WITH VODACOM ROAMING.
1 World. 3 Zones. 1 Global family.

QUICK FIND COUNTRY

Charge Type	Local Calls*	Calls to SA or International*	Receiving a Call	Sending an SMS	Standard Data Rates per MB**	Super Saver Data Rates per MB**
Standard	R 8.00	R 23.50	R 6.00	R 2.75	R 128.00	R 17.50
10% Discount (voice calls only)	R 7.20	R 21.15				

* Call discount on selected Networks
** Data discount on selected Networks
For more information on selected network providers within the selected country, please contact our customer services as listed below:
Vodacom Customer Services:
E-mail: customer@vodacom.co.za
Tel: 082 111
Fax: 0860 082 082



Source: <http://www.vodacom.co.za/vodacom/StaticFiles/Roaming/main.swf>; accessed 21/10/2010

MTN

Continent	Local Calls	Int. Calls / South Africa	Receiving Calls	SMSs	Internet (Per 25KB)	Internet/MB
Africa	R 5.00	R 7.00	R 4.00	R 2.00	R 2.60	R 104.00
Asia	R 8.25	R 25.50	R 4.00	R 2.75	R 3.50	R 140.00
Europe	R 8.00	R 23.50	R 4.00	R 2.75	R 2.70	R 108.00
Oceania	R 7.50	R 23.50	R 4.00	R 2.75	R 4.00	R 160.00
South America	R 8.25	R 38.00	R 4.00	R 2.75	R 3.00	R 120.00
North America	R 11.00	R 20.00	R 4.00	R 2.75	R 3.50	R 140.00
Exclusions*	R 9.50	R 25.50	R 4.00	R 2.75	R 2.60	R 104.00

* Angola, Democratic Republic of Congo, Kenya, Tanzania and Zimbabwe

Source: <http://www.mtn.co.za/Travel/TravellingFromSA/Pages/RoamingTarrifs.aspx>

Accessed 21/10/2010

Cell C

Cell C roaming rates for India – 21 October 2010

Source: <http://www.cellc.co.za/services/international-roaming>

Where can I roam?

Before you pack your bags see if you can roam:

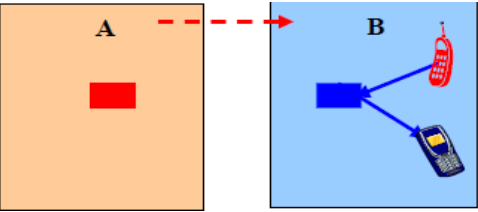
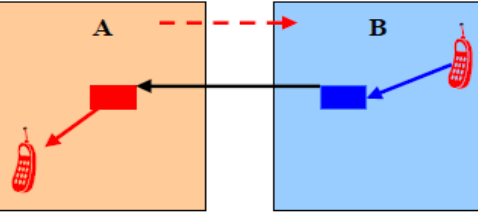
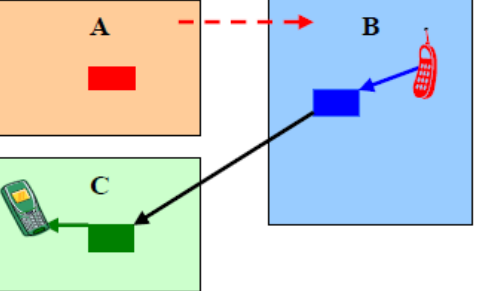
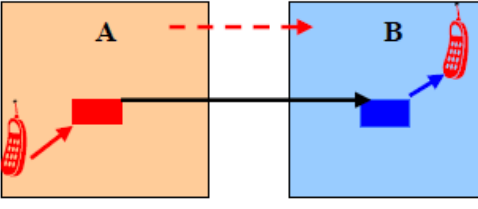
Network	Local	International (Call to SA)	SMS MO	Receive a call	Frequency	Conference Call	GPRS	3G
Aircel (ex RPG Cellular)	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	No	R 116.90	
Aircel Andhra Pradesh	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Aircel Bihar	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	No	R 120.32	
Aircel Delhi	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Aircel Gujurat	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Aircel Haryana	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Aircel Himachal Pradesh	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Aircel Karnataka	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Aircel Kerala	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Aircel Kolkata	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Aircel Madhya Pradesh	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Aircel Maharashtra	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Aircel Mumbai	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Aircel Orissa	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Aircel Punjab	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Aircel Rajasthan	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Aircel RoTN	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Aircel UP East	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Aircel UP West	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Aircel West Bengal	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Bharti Airtel Andhra pradesh	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Bharti Airtel Chennai	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Bharti Airtel Haryana	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Bharti Airtel Himachal Pradesh	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Bharti Airtel Karnataka	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Bharti Airtel Kerala	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Bharti Airtel Kolkota	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Bharti Airtel Madhya Pradesh	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Bharti Airtel Maharashtra	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	



Bharti Airtel Mumbai	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Bharti Airtel New Delhi	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Bharti Airtel Punjab	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Bharti Airtel Rajasthan (Ex Hexacom)	R 11.19	R 22.60	R 4.57	R 17.12	GSM 900	Yes	R 120.32	
Bharti Airtel Tamil Nadu	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Bharti Airtel UP West	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	No	R 120.32	
BPL Mobile Ltd	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	No	R 116.90	
BSNL	R 6.85	R 15.98	R 4.57	R 13.99	GSM 900	No	R 0.00	
BTA Cellcom	R 13.70	R 13.70	R 2.63	R 16.27	GSM 900	No	R 0.00	
Idea (Escotel) mobile communications	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	No	R 116.90	
Idea Cellular	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 116.90	
LOOP Mobile Ltd	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	No	R 116.90	
MTNL	R 11.19	R 22.60	R 4.68	R 19.69	GSM 900	No	R 0.00	
Reliance Telecom	R 17.12	R 17.12	R 6.85	R 19.69	GSM 900	No	R 120.32	
Spice Telecom	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	No	R 120.32	
Spice Telecom-Karnataka	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	No	R 116.90	
Vodafone Essar Cellular	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	Yes	R 120.32	
Vodafone Essar Cellular East Ltd	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	No	R 120.32	
Vodafone Essar Ltd	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	No	R 120.32	
Vodafone Essar Mobile services	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	No	R 120.32	
Vodafone Essar-Fascel-Gujarat	R 11.19	R 22.60	R 4.57	R 19.69	GSM 900	No	R 116.90	

Above rates serve as an indication only and are subject to change due to exchange rates etc.
Rates are in South African Rands and include VAT

APPENDIX 3: Comparing cost structure of IMR and domestic services in visited country

Roaming call type	Illustration	Roaming cost elements	Cost elements for equivalent call by subscriber of visited network
<p>Call inside visited country B</p> <p>A traveller from country A goes to country B and makes a local call to a subscriber of country B.</p>		<p>Mobile origination in country B + Mobile termination in country B + roaming specific costs</p>	<p>Mobile origination in country B + Mobile termination in country B</p>
<p>Call from visited country B to the home country A</p> <p>A traveller from country A goes to country B and makes an international call back home to a subscriber in country A.</p>		<p>Mobile origination in country B + International transit + Mobile/Fixed termination in country A + roaming specific costs</p>	<p>Mobile origination in country B + International transit + Mobile/Fixed termination in country A</p>
<p>Call from visited country B to a third country C</p> <p>A traveller from country A goes to country B and makes a call to a subscriber in country C.</p>		<p>Mobile origination in country B + International transit + Mobile/Fixed termination in country C + roaming specific costs</p>	<p>Mobile origination in country B + International transit + Mobile/Fixed termination in country C</p>
<p>Receiving a call in a visited country</p> <p>A traveller from country A goes to country B and receives a call from either country or a different country C.</p>		<p>Mobile termination in country B + International transit + roaming specific costs</p>	<p>Mobile termination in country B + International transit</p>

Source: Adapted from ITU (2008), pg. 7. Note: Outbound roamer from country A visits country B.

APPENDIX 4: Consistency Matrix

Hypotheses	Literature Review	Data Collection	Analysis
<p>Hypothesis 1: IMR usage</p> <p>$H1_0: \mu_B = \mu_C$</p> <p>$H1_A: \mu_B > \mu_C$</p>	<p>Analysis Mason (2010); Informa (2008); Informa (2010); OECD (2009); Sutherland (2010a); ITU (2008); Baye (2009); EC (2007); CRASA (2010); Jervelund <i>et al.</i> (2007)</p>	<p>Survey questionnaire using 5 point Likert-type scales. Question 13</p>	<p>Descriptive statistics – mean, standard deviation; t-test</p>
<p>Hypothesis 2: IMR usage relative to ACM</p> <p>$H2_0: \mu_B = \mu_C$</p> <p>$H2_A: \mu_B > \mu_C$</p>	<p>Analysis Mason (2010); Sutherland (2001); Sutherland (2010a); OECD (2010); ITU (2008)</p>	<p>Survey questionnaire using 5 point Likert-type scales. Question 13</p>	<p>Descriptive statistics – mean, standard deviation; t-test</p>
<p>Hypothesis 3: IMR tariffs reduced</p> <p>$H3_0: \mu_{TR} \leq 3$;</p> <p>$H3_A: \mu_{TR} > 3$ (scale midpoint)</p>	<p>Sutherland (2010a); Gillwald and Muriethi (2009); Gillwald and Muriethi (2010); OECD (2009); ITU (2008); Sutherland (2010a); GSMA (2008a); Versi (2007); Informa (2010); CRASA (2010); CEC (2006); BEREC (2010); Jervelund <i>et al.</i> (2007)</p>	<p>Survey questionnaire using 5 point Likert-type scales. Questions 16, 17</p>	<p>Descriptive statistics – mean, standard deviation; t-test</p>
<p>Hypothesis 4: Competition vs. regulation</p> <p>$H4_0: \mu_{Com} = \mu_{Reg}$</p> <p>$H4_A: \mu_{Com} > \mu_{Reg}$</p>	<p>Sutherland (2010a); Gillwald and Muriethi (2009); Gillwald and Muriethi (2010); OECD (2009); ITU (2008); GSMA (2008a); Versi (2007); Informa (2010); McCormick (2003); Andres <i>et al.</i> (2007); Intven <i>et al.</i> (2000); Khemani (2007); Van Gorp & Middleton (2010)</p>	<p>Survey questionnaire using 5 point Likert-type scales. Questions 14, 16, 17</p>	<p>Descriptive statistics – mean, standard deviation; cross tabulations; t-test</p>
<p>Hypothesis 5: Demand elasticity</p> <p>$H5_0: \mu_{TR} = 3$</p> <p>$H5_A: \mu_{TR} > 3$ (scale midpoint)</p>	<p>Analysis Mason (2010); GSMA (2008a); Baye (2009); CEC (2008); OECD (2010); OECD (2009); OECD (2007); ITU (2008); Sutherland (2010a); Informa (2008); Informa (2010); EC (2007)</p>	<p>Survey questionnaire using 5 point Likert-type scales. Question 18</p>	<p>Descriptive statistics – mean, standard deviation; t-test</p>
<p>Hypothesis 6: Regulatory Intervention reduces competition</p> <p>$H6_0: \mu_{RI} = 3$</p> <p>$H6_A: \mu_{RI} < 3$ (scale midpoint)</p>	<p>Smith (2010); Analysis Mason (2010); Intven <i>et al.</i> (2000); McAleese (2004); Andres <i>et al.</i> (2007); CRASA (2010); BEREC (2010); CEC (2006); EC (2007); Minister of Communications (2004); Jervelund <i>et al.</i> (2007)</p>	<p>Survey questionnaire using 5 point Likert-type scales. Question 15</p>	<p>Descriptive statistics – mean, standard deviation; t-test</p>

APPENDIX 5: Panel of experts used to pre-test questionnaire

Name	Designation	Organisation
Mr Kojo Parris	Lecturer on Social Entrepreneurship	University of Pretoria's Gordon Institute of Business Science (Gibs)
	Visiting Fellow	University of Leeds
Mr Petsmaster Chinembiri	Financial Expert : Northern Region	Development Bank of Southern Africa (DBSA)
Mr Johan Smit	Manager: TSI: Wireless Strategy and Regulations	Telkom South Africa
Mr Warren La Fleur	Sales Manager - Botswana and Namibia	Microsoft
Ms Julia Hope	Ex-Councillor	Independent Communications Authority of South Africa (ICASA)
	Senior Partner	Centre for Telecommunications and Regulatory Affairs, South Africa
Ms Thenjiwe Dube	Manager Consumer Affairs	Independent Communications Authority of South Africa (ICASA)
Mr Tinyiko Ngobeni	Advisor – Technical Regulation	Vodacom
Mr Harrish Kasseepursad	Senior Manager Technical Regulation	Cell C
	Ex-Manager, Numbering Administration	Independent Communications Authority of South Africa (ICASA)
Mr Thapelo Mogopa	Senior Manager	Botswana Telecommunications Authority (BTA)
Mr Luis Mhula	Chief Operating Officer	mCel, Mozambique
	Ex- Director Wholesale Services	TDM, Mozambique
Ms Jeanette La Fleur	Part time French Teacher – MA Applied English Studies	Brescia House, Johannesburg, South Africa
Mr Peter Hlapolosa	Executive Head of Division – Economic Regulation	Vodacom
	Ex-General Manager Telecommunications and Economic Policy Analysis	Independent Communications Authority of South Africa (ICASA)

APPENDIX 6: Questionnaire



International mobile roaming in the SADC region

1. Introduction

Thank you for agreeing to participate in this survey, which should take about 8 minutes to complete.

I am a MBA student at the University of Pretoria's Gordon Institute of Business Science (GIBS) and this research project is a requirement for successful completion of the programme.

This survey aims to collect information about the availability and use of international mobile roaming (IMR) in the Southern African Development Community (SADC).

International mobile roaming refers to the ability for a cellular customer to automatically make and receive voice calls, send and receive data, or access other services when travelling outside the home country, by means of using a visited network. Billing for IMR is done by the home mobile network operator (MNO).

SADC currently has the following member countries – Angola, Botswana, Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe.

Please note that you should only complete this survey if you live or work in the SADC region, have a cellular phone and have travelled to another SADC country.



International mobile roaming in the SADC region

2. Informed consent

Your participation in this survey is voluntary and you may withdraw at any time. By completing this survey you indicate that you voluntarily participate in this research. All data collected during this research will be kept strictly confidential and participants will remain anonymous. You may seek clarification or access to a summary of the results by requesting same from me or my research supervisor on the details provided below:

Researcher

Name: Mortimer Hope

Email: mhope@hcn.co.za

Phone: +27 82 994 8248

Research Supervisor

Name: Dr. Harold Campbell

Email: campbell.harold@gmail.com

Phone: +27 78 801 8775



International mobile roaming in the SADC region

3. Demographics

Please answer the following questions.

*** 1. Which is your home country where you normally live or work?**

- | | | |
|---|-------------------------------------|---------------------------------------|
| <input type="checkbox"/> Angola | <input type="checkbox"/> Malawi | <input type="checkbox"/> South Africa |
| <input type="checkbox"/> Botswana | <input type="checkbox"/> Mauritius | <input type="checkbox"/> Swaziland |
| <input type="checkbox"/> Democratic Republic of Congo | <input type="checkbox"/> Mozambique | <input type="checkbox"/> Tanzania |
| <input type="checkbox"/> Lesotho | <input type="checkbox"/> Namibia | <input type="checkbox"/> Zambia |
| <input type="checkbox"/> Madagascar | <input type="checkbox"/> Seychelles | <input type="checkbox"/> Zimbabwe |
| <input type="checkbox"/> Other (please specify) | | |

2. What is your gender?

- Male
- Female

*** 3. What is your monthly household income?**

- | | |
|---|---|
| <input type="checkbox"/> Less than USD50 | <input type="checkbox"/> USD501 to USD2,000 |
| <input type="checkbox"/> USD50 to USD200 | <input type="checkbox"/> USD2,001 to USD5,000 |
| <input type="checkbox"/> USD201 to USD500 | <input type="checkbox"/> More than USD5,000 |



International mobile roaming in the SADC region

4. Cellular phone ownership

* 4. Do you have a cellular phone?

Yes

No

5. What type of cellular package are you on?

Post paid / contract

Prepaid

* 6. Who pays for your cellular usage?

Self

Company

Relative

Sponsor

Other (please specify)



International mobile roaming in the SADC region

5. Travel habits

* 7. Have you ever travelled to another country in SADC?

Yes

No

8. Have you ever travelled to another country outside of SADC?

Yes

No

* 9. Which are the top three (3) countries in SADC that you visit most often? (select up to three countries that are different from your answer to question 1)

Not applicable

Malawi

Swaziland

Angola

Mauritius

Tanzania

Botswana

Mozambique

Zambia

Democratic Republic of Congo

Namibia

Zimbabwe

Lesotho

Seychelles

Madagascar

South Africa



International mobile roaming in the SADC region

6. Mobile cellular usage in home country

10. On average, how many minutes of outgoing voice calls do you make monthly when in your home country?

- less than 20 minutes
- 21 - 60 minutes
- 61 - 120 minutes
- 121 - 240 minutes
- 241 - 400 minutes
- 400+ minutes

11. On average, how many SMS do you send monthly when in your home country?

- Less than 20 SMS
- 21 - 60 SMS
- 61 - 120 SMS
- 121 - 240 SMS
- 241 - 400 SMS
- 400+ SMS

12. On average, how much mobile data do you use monthly when in your home country?

- Less than 20 MB
- 21 - 100 MB
- 101 - 200 MB
- 201 - 500 MB
- 501 - 1000 MB
- 1000+ MB



International mobile roaming in the SADC region

7. Use of roaming and alternative communication methods

* 13. When visiting another country in SADC, I use my home SIM card:

	Always	Often	Fairly often	Hardly	Never
to roam.	jn	jn	jn	jn	jn
to make roaming voice calls.	jn	jn	jn	jn	jn
to send SMS/text messages when I roam.	jn	jn	jn	jn	jn
to access mobile data when I roam.	jn	jn	jn	jn	jn
to send SMS/text messages instead of making roaming voice calls.	jn	jn	jn	jn	jn
instead of a local SIM card from that country.	jn	jn	jn	jn	jn
to make roaming voice calls instead of using a hotel phone.	jn	jn	jn	jn	jn
to make roaming voice calls instead of using a public payphone.	jn	jn	jn	jn	jn
to make roaming voice calls instead of using a calling card with a local phone.	jn	jn	jn	jn	jn
to make roaming voice calls instead of using call back services.	jn	jn	jn	jn	jn
to make roaming voice calls instead of using Internet telephony, such as Skype and Yahoo Messenger.	jn	jn	jn	jn	jn
to make roaming voice calls instead of using other communication methods besides those mentioned above.	jn	jn	jn	jn	jn



International mobile roaming in the SADC region

8. Effect of roaming regulation on tariffs and competition

14. International mobile roaming (IMR) retail tariffs will be reduced if my home mobile network operator (MNO):

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
has its IMR retail tariffs regulated.	jn	jn	jn	jn	jn
has to send me a free SMS containing the roaming tariffs whenever I visit another country in SADC.	jn	jn	jn	jn	jn
has to cut off international mobile roaming whenever I reach a pre-determined monetary limit e.g. USD100.	jn	jn	jn	jn	jn
is not regulated.	jn	jn	jn	jn	jn

15. My home mobile network operator (MNO) will be forced out of business if:

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
its IMR retail tariffs are regulated.	jn	jn	jn	jn	jn
it has to implement tariff transparency measures such as free SMS showing IMR tariff when I enter another SADC country.	jn	jn	jn	jn	jn
it has to cut off international mobile roaming whenever I reach a pre-determined monetary limit e.g. USD100.	jn	jn	jn	jn	jn
there is no regulatory intervention.	jn	jn	jn	jn	jn



International mobile roaming in the SADC region

9. Tariffs

16. The tariff of an international mobile roaming call:

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
to a local number in the visited country is more expensive than the tariff of a similar local call in my home country.	jñ	jñ	jñ	jñ	jñ
from the visited country to my home country is more expensive than the tariff of an international call from my home network to the visited country.	jñ	jñ	jñ	jñ	jñ
has reduced in the last three years.	jñ	jñ	jñ	jñ	jñ

* 17. My home mobile network operator (MNO) has reduced international mobile roaming (IMR) retail tariffs in the last three years:

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
due to competition.	jñ	jñ	jñ	jñ	jñ
due to regulatory intervention.	jñ	jñ	jñ	jñ	jñ

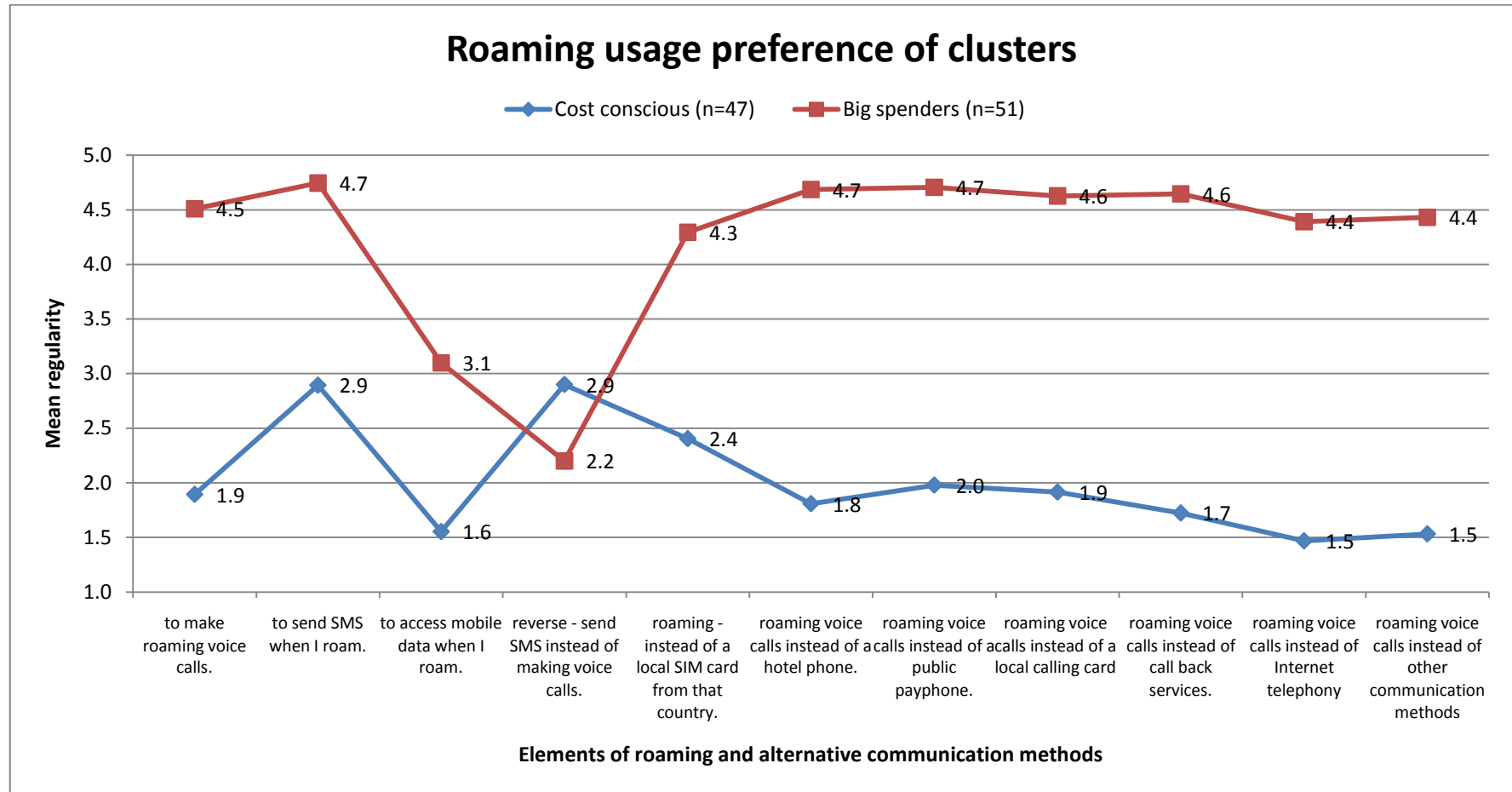
* 18. I will use international mobile roaming (IMR) more frequently if:

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
the tariff is reduced substantially.	jñ	jñ	jñ	jñ	jñ
the IMR tariff is similar to my home tariff for a similar call	jñ	jñ	jñ	jñ	jñ

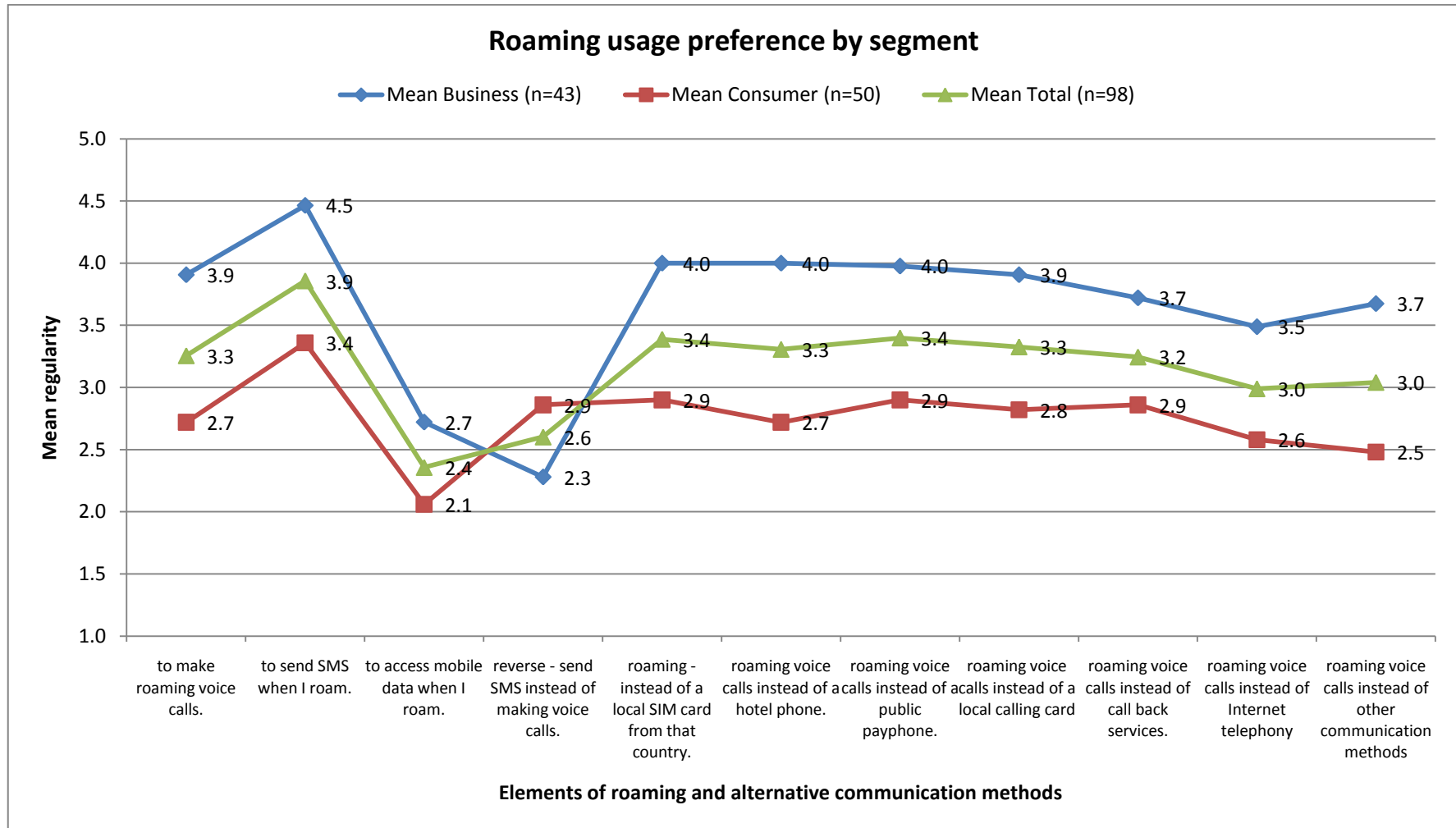
APPENDIX 7: Statistical Results

- Appendix 7.1: Graphs – roaming usage preference by cluster, and by segment.
- Appendix 7.2: Question 13 – IMR and ACM usage. T-test for all respondents.
- Appendix 7.3: Question 13 – IMR and ACM usage. T-test for independent groups.
- Appendix 7.4: Question 16 - IMR retail tariff has reduced in the last three years. T-test for all respondents.
- Appendix 7.5: Question 16 - IMR retail tariff has reduced in the last three years. T-test for Business travellers.
- Appendix 7.6: Question 16 - IMR retail tariff has reduced in the last three years. T-test for Consumer travellers.
- Appendix 7.7: Question 17 - IMR retail tariff has reduced due to competition, or due to regulation. T-test for dependent samples.
- Appendix 7.8: Question 18 – Demand elasticity of IMR retail tariff. T-test for all respondents.
- Appendix 7.9: Question 15 – Regulatory intervention reduces competition. T-test for all respondents.

Appendix 7.1.1: Graph - roaming usage preference by cluster



Appendix 7.1.2: Graph - roaming usage preference by segment



Appendix 7.2: Question 13 – IMR and ACM usage. T-test for all respondents

International mobile roaming (IMR) and alternative calling mechanisms (ACM)

	Mean	Std. Dev.	N	Std. Err.	Reference	t-value	df	p
to make roaming voice calls.	3.255102	1.568447	98	0.158437	3.000000	1.61012	97	0.110622
to send SMS/text messages when I roam.	3.857143	1.406905	98	0.142119	3.000000	6.03117	97	0.000000
to access mobile data when I roam.	2.357143	1.437710	98	0.145231	3.000000	-4.42646	97	0.000025
to send SMS/text messages instead of making roaming voice calls.	3.397959	1.375333	98	0.138930	3.000000	2.86447	97	0.005121
instead of a local SIM card from that country.	3.387755	1.577108	98	0.159312	3.000000	2.43394	97	0.016765
to make roaming voice calls instead of using a hotel phone.	3.306122	1.658519	98	0.167536	3.000000	1.82721	97	0.070743
to make roaming voice calls instead of using a public payphone.	3.397959	1.641848	98	0.165852	3.000000	2.39949	97	0.018328
to make roaming voice calls instead of using a calling card with a local phone.	3.326531	1.616765	98	0.163318	3.000000	1.99936	97	0.048367
to make roaming voice calls instead of using call back services.	3.244898	1.699371	98	0.171662	3.000000	1.42663	97	0.156899
to make roaming voice calls instead of using Internet telephony, such as Skype and Yahoo Messenger.	2.989796	1.659058	98	0.167590	3.000000	-0.06089	97	0.951574
to make roaming voice calls instead of using other communication methods besides those mentioned above.	3.040816	1.661687	98	0.167856	3.000000	0.24316	97	0.808392

Appendix 7.3.1: Question 13 – IMR usage for item “to make roaming calls”. T-test for independent groups

Variable	to make roaming voice calls					
Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95.0% LCL of Mean	95.0% UCL of Mean
Who pays for your cellular usage=Company	43	3.906977	1.324026	0.2019121	3.499502	4.314452
Who pays for your cellular usage=Self	50	2.72	1.591303	0.2250442	2.267757	3.172243
Note: T-alpha (Who pays for your cellular usage=Company) = 2.0181, T-alpha (Who pays for your cellular usage=Self) = 2.0096						
Confidence-Limits of Difference Section						
Variance Assumption	DF	Mean Difference	Standard Deviation	Standard Error	95.0% LCL Difference	95.0% UCL Difference
Equal	91	1.186977	1.473979	0.3065586	0.5780357	1.795918
Unequal	90.91	1.186977	2.070094	0.3023465	0.5863947	1.787559
Note: T-alpha (Equal) = 1.9864, T-alpha (Unequal) = 1.9864						
Equal-Variance T-Test Section						
Alternative Hypothesis	T-Value	Prob Level	Reject H0 at .050	Power (Alpha=.050)	Power (Alpha=.010)	
Difference <> 0	3.8719	0.000203	Yes	0.969314	0.889742	
Difference < 0	3.8719	0.999898	No	0	0	
Difference > 0	3.8719	0.000102	Yes	0.986028	0.931578	
Difference: (Who pays for your cellular usage=Company)-(Who pays for your cellular usage=Self)						

Tests of Assumptions Section			
Assumption	Value	Probability	Decision(.050)
Skewness Normality (Who pays for your cellular usage=Company)	-2.2815	0.022522	Reject normality
Kurtosis Normality (Who pays for your cellular usage=Company)	-1.243	0.213854	Cannot reject normality
Omnibus Normality (Who pays for your cellular usage=Company)	6.7502	0.034215	Reject normality
Skewness Normality (Who pays for your cellular usage=Self)	0.9939	0.320292	Cannot reject normality
Kurtosis Normality (Who pays for your cellular usage=Self)	-6.4891	0	Reject normality
Omnibus Normality (Who pays for your cellular usage=Self)	43.0961	0	Reject normality
Variance-Ratio Equal-Variance Test	1.4445	0.225093	Cannot reject equal variances
Modified-Levene Equal-Variance Test	2.1529	0.145744	Cannot reject equal variances

Appendix 7.3.2: Question 13 – IMR and ACM usage. T-test for independent groups

International mobile roaming (IMR) and alternative calling mechanisms (ACM)

Valid N Business = 43; Valid N Consumer = 50	Mean Business	Mean Consumer	t-value	df	p	Std. Dev. Business	Std. Dev. Consumer	F-ratio	p variances
to make roaming voice calls.	3.9	2.7	3.87194	91	0.000203	1.324026	1.591303	1.444483	0.225093
to send SMS/text messages when I roam.	4.5	3.4	4.029758	91	0.000116	0.90892	1.587708	3.051337	0.000336
to access mobile data when I roam.	2.7	2.1	2.202331	91	0.030169	1.608394	1.284285	1.56842	0.129735
reverse - to send SMS/text messages instead of making roaming voice calls.	2.28	2.86	2.027741	91	0.045511	1.161395	1.538751	1.755405	0.064464
instead of a local SIM card from that country.	4	2.9	3.477484	91	0.000778	1.380131	1.631951	1.398214	0.268728
to make roaming voice calls instead of using a hotel phone.	4	2.7	3.993936	91	0.000132	1.380131	1.666476	1.458	0.213613
to make roaming voice calls instead of using a public payphone.	4	2.9	3.318539	91	0.001302	1.336099	1.729103	1.674805	0.089777
to make roaming voice calls instead of using a calling card with a local phone.	3.9	2.8	3.416023	91	0.000951	1.341888	1.674417	1.557022	0.144576
to make roaming voice calls instead of using call back services.	3.7	2.9	2.484212	91	0.014813	1.57851	1.73805	1.212354	0.525912
to make roaming voice calls instead of using Internet telephony, such as Skype and Yahoo Messenger.	3.5	2.6	2.706809	91	0.008113	1.548764	1.667088	1.158635	0.628657
to make roaming voice calls instead of using other communication methods besides those mentioned above.	3.7	2.5	3.677519	91	0.000398	1.554118	1.568048	1.018007	0.958512

Appendix 7.4: Question 16 - IMR retail tariff has reduced in the last three years. T-test for all respondents.

Variable	has reduced in the last three years					
Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95.0% LCL of Mean	95.0% UCL of Mean
has reduced in the last three years	88	2.875	1.048398	0.1117596	2.652866	3.097134
T for Confidence Limits = 1.9876						
Tests of Assumptions Section						
Assumption	Value	Probability	Decision(.050)			
Skewness Normality	-0.9363	0.349136	Cannot reject normality			
Kurtosis Normality	-0.712	0.476447	Cannot reject normality			
Omnibus Normality	1.3836	0.500679	Cannot reject normality			
Correlation Coefficient						
T-Test For Difference Between Mean and Value Section						
Alternative Hypothesis	T-Value	Prob Level	Reject H0 at .050	Power (Alpha=.05)	Power (Alpha=.01)	
has reduced in the last three years <>3	-1.1185	0.266444	No	0.197689	0.069754	
has reduced in the last three years <3	-1.1185	0.133222	No	0.296299	0.110254	
has reduced in the last three years >3	-1.1185	0.866778	No	0.002937	0.000304	

Appendix 7.5: Question 16 - IMR retail tariff has reduced in the last three years. T-test for Business travellers

Variable	has reduced in the last three years					
Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95.0% LCL of Mean	95.0% UCL of Mean
has reduced in the last three years	41	3.04878	1.071243	0.1673	2.710654	3.386906
T for Confidence Limits = 2.0211						
Tests of Assumptions Section						
Assumption	Value	Probability	Decision(.050)			
Skewness Normality	-0.6499	0.515764	Cannot reject normality			
Kurtosis Normality	-0.3476	0.728168	Cannot reject normality			
Omnibus Normality	0.5432	0.762176	Cannot reject normality			
Correlation Coefficient						
T-Test For Difference Between Mean and Value Section						
Alternative Hypothesis	T-Value	Prob Level	Reject H0 at .050	Power (Alpha=.05)	Power (Alpha=.01)	
has reduced in the last three years <>3	0.2916	0.772118	No	0.059332	0.012984	
has reduced in the last three years <3	0.2916	0.613941	No	0.026708	0.00455	
has reduced in the last three years >3	0.2916	0.386059	No	0.087203	0.020455	

Appendix 7.6: Question 16 - IMR retail tariff has reduced in the last three years. T-test for Consumer travellers

Variable	has reduced in the last three years					
Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95.0% LCL of Mean	95.0% UCL of Mean
has reduced in the last three years	43	2.767442	1.019739	0.1555087	2.453613	3.081271
T for Confidence Limits = 2.0181						
Tests of Assumptions Section						
Assumption	Value	Probability	Decision(.050)			
Skewness Normality	-1.0118	0.311649	Cannot reject normality			
Kurtosis Normality	-0.3571	0.721009	Cannot reject normality			
Omnibus Normality	1.1512	0.562367	Cannot reject normality			
Correlation Coefficient						
T-Test For Difference Between Mean and Value Section						
Alternative Hypothesis	T-Value	Prob Level	Reject H0 at .050	Power (Alpha=.05)	Power (Alpha=.01)	
has reduced in the last three years <>3	-1.4955	0.142269	No	0.309332	0.127447	
has reduced in the last three years <3	-1.4955	0.071135	No	0.431122	0.189787	
has reduced in the last three years >3	-1.4955	0.928865	No	0.000915	0.00008	

Appendix 7.7: Question 17 - IMR retail tariff has reduced due to competition, or due to regulation. T-test for dependent samples.

Paired T-Test Report (comparison of perceptions about whether competition or regulatory intervention reduced IMR tariffs)

Variable	X1 = due to competition, X2 = due to regulatory intervention					
Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95.0% LCL of Mean	95.0% UCL of Mean
due to competition	90	3.022222	1.180152	0.124399	2.775044	3.2694
due to regulatory intervention	90	2.644444	1.084219	0.1142867	2.417359	2.87153
Difference	90	0.3777778	1.33726	0.1409596	9.77E-02	0.6578615
T for Confidence Limits = 1.9870						
Tests of Assumptions about Differences Section						
Assumption	Value	Probability	Decision(.050)			
Skewness Normality	1.9983	0.045681	Reject normality			
Kurtosis Normality	1.4718	0.141073	Cannot reject normality			
Omnibus Normality	6.1595	0.04597	Reject normality			
Correlation Coefficient	0.304806					
T-Test For Difference Between Means Section						
Alternative Hypothesis	T-Value	Prob Level	Reject H0 at .050	Power (Alpha=.05)	Power (Alpha=.01)	
due to competition - due to regulatory intervention <>0	2.68	0.00877	Yes	0.755238	0.521641	
due to competition - due to regulatory intervention <0	2.68	0.995615	No	0.000008	0	
due to competition - due to regulatory intervention >0	2.68	0.004385	Yes	0.844882	0.622818	

Appendix 7.8.1: Question 18 – Demand elasticity of international mobile roaming. T-test for all respondents

T-Test of item “more frequent use if tariff is reduced substantially” mean against scale midpoint of 3 – all respondents

Variable	the tariff is reduced substantially					
Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95.0% LCL of Mean	95.0% UCL of Mean
the tariff is reduced substantially	90	4.366667	0.9881318	0.1041582	4.159707	4.573627
T for Confidence Limits = 1.9870						
Tests of Assumptions Section						
Assumption	Value	Probability	Decision(.050)			
Skewness Normality	-5.7495	0	Reject normality			
Kurtosis Normality	3.7792	0.000157	Reject normality			
Omnibus Normality	47.3392	0	Reject normality			
Correlation Coefficient						
T-Test For Difference Between Mean and Value Section						
Alternative Hypothesis	T-Value	Prob Level	Reject H0 at .050	Power (Alpha=.05)	Power (Alpha=.01)	
the tariff is reduced substantially <>3	13.1211	0	Yes	1	1	
the tariff is reduced substantially <3	13.1211	1	No	0	0	
the tariff is reduced substantially >3	13.1211	0	Yes	1	1	

Appendix 7.8.2: Question 18 – Demand elasticity of international mobile roaming. T-test for all respondents

T-Test of item “more frequent use if tariff is similar to home tariff” mean against scale midpoint of 3 – all respondents

Variable	IMR tariff similar to home tariff					
Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95.0% LCL of Mean	95.0% UCL of Mean
IMR tariff similar to home tariff	90	4.277778	0.899785	0.0948457	4.089322	4.466234
T for Confidence Limits = 1.9870						
Tests of Assumptions Section						
Assumption	Value	Probability	Decision(.050)			
Skewness Normality	-4.4079	0.00001	Reject normality			
Kurtosis Normality	2.3543	0.018555	Reject normality			
Omnibus Normality	24.973	0.000004	Reject normality			
Correlation Coefficient						
T-Test For Difference Between Mean and Value Section						
Alternative Hypothesis	T-Value	Prob Level	Reject H0 at .050	Power (Alpha=.05)	Power (Alpha=.01)	
IMR tariff similar to home tariff <>3	13.4722	0	Yes	1	1	
IMR tariff similar to home tariff <3	13.4722	1	No	0	0	
IMR tariff similar to home tariff >3	13.4722	0	Yes	1	1	

Appendix 7.9.1: Question 15 – Regulatory intervention reduces competition. T-test for all respondents.

T-Test of item “its IMR retail tariffs are regulated” mean against scale midpoint of 3 – all respondents

Variable	its IMR retail tariffs are regulated					
Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95.0% LCL of Mean	95.0% UCL of Mean
its IMR retail tariffs are regulated	91	1.89011	0.862175	0.09038	1.710553	2.069666
T for Confidence Limits = 1.9867						
Tests of Assumptions Section						
Assumption	Value	Probability	Decision(.050)			
Skewness Normality	3.7416	0.000183	Reject normality			
Kurtosis Normality	2.1384	0.032482	Reject normality			
Omnibus Normality	18.5722	0.000093	Reject normality			
Correlation Coefficient						
T-Test For Difference Between Mean and Value Section						
Alternative Hypothesis	T-Value	Prob Level	Reject H0 at .050	Power (Alpha=.05)	Power (Alpha=.01)	
its IMR retail tariffs are regulated <>3	-12.2802	0	Yes	1	1	
its IMR retail tariffs are regulated <3	-12.2802	0	Yes	1	1	
its IMR retail tariffs are regulated >3	-12.2802	1	No	0	0	

Appendix 7.9.2: Question 15 – Regulatory intervention reduces competition. T-test for all respondents.

T-Test of item “transparency measures such as free” mean against scale midpoint of 3 – all respondents

Variable	transparency measures such as free					
Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95.0% LCL of Mean	95.0% UCL of Mean
transparency measures such as free	92	1.945652	1.062489	0.110772	1.725617	2.165687
T for Confidence Limits = 1.9864						
Tests of Assumptions Section						
Assumption	Value	Probability	Decision(.050)			
Skewness Normality	3.6014	0.000316	Reject normality			
Kurtosis Normality	0.2661	0.790174	Cannot reject normality			
Omnibus Normality	13.0411	0.001473	Reject normality			
Correlation Coefficient						
T-Test For Difference Between Mean and Value Section						
Alternative Hypothesis	T-Value	Prob Level	Reject H0 at .050	Power (Alpha=.05)	Power (Alpha=.01)	
transparency measures such as free <>3	-9.5182	0	Yes	1	1	
transparency measures such as free <3	-9.5182	0	Yes	1	1	
transparency measures such as free >3	-9.5182	1	No	0	0	

Appendix 7.9.3: Question 15 – Regulatory intervention reduces competition. T-test for all respondents.

T-Test of item “cut off IMR at pre determined monet” mean against scale midpoint of 3 – all respondents

Variable	cut off IMR at pre determined monet					
Descriptive Statistics Section						
Variable	Count	Mean	Standard Deviation	Standard Error	95.0% LCL of Mean	95.0% UCL of Mean
cut off IMR at pre determined monet	91	2.175824	1.11149	0.116516	1.944345	2.407303
T for Confidence Limits = 1.9867						
Tests of Assumptions Section						
Assumption	Value	Probability	Decision(.050)			
Skewness Normality	3.2247	0.001261	Reject normality			
Kurtosis Normality	0.4343	0.664093	Cannot reject normality			
Omnibus Normality	10.5871	0.005024	Reject normality			
Correlation Coefficient						
T-Test For Difference Between Mean and Value Section						
Alternative Hypothesis	T-Value	Prob Level	Reject H0 at .050	Power (Alpha=.05)	Power (Alpha=.01)	
cut off IMR at pre determined monet <>3	-7.0735	0	Yes	1	0.999994	
cut off IMR at pre determined monet <3	-7.0735	0	Yes	1	0.999998	
cut off IMR at pre determined monet >3	-7.0735	1	No	0	0	