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Prime Mover

Internet Quality in Southern Ghana for Businesses

Vendor: Viope Solutions Oy

Aboagye-Da-Costa, Patrick Dankwa

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Internet Quality in Ghana for Businesses

Vendor: Viope Solutions Oy

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This thesis was commissioned by Viope Solutions Oy, an eLearning company based in Helsinki, Finland. The objective of the study was to study the prevailing internet connections in Ghana and evaluate their reliability for commercial purposes. The Company wants to set up a server in Ghana providing eLearning services to Ghanaian customers. The company requested an independent study which would provide information regarding which operator provides the most reliable internet connections, in the country and as well the regions with the highest concentration of internet users, what options are available and what can be recommend for them.

This research was carried out using the techniques of impartial observation, in which the internet service offered by operators to customers were investigated and tested. The research consisted of a reliability analysis, where reliability was evaluated in terms of service availability, service accessibility and service coverage.

The theoretical chapter of this thesis contains a history of the internet in Ghana, and a discussion about how internet reliability will be evaluated.

Finally, the theoretical section examines the benchmarks used in internet reliability.

The empirical section was about the company, Viope Solutions Oy, and the results of the study. Also, based on the results of the research possible business options for the company in Ghana are outlined.

This work utilised qualitative and analytical research supplied by a local agent in Ghana, who in addition to the writer, travelled across the country, to test/investigate the reliability of internet connections. Based on these factors, a reliability census was established. The rationale for this method is explained in the work.

As results of research into the best geographical locations in Ghana, the company may consider it viable to start its operations. This thesis can serve as a practical document, for the company to independently, rely on as it may hire the internet service it requires, with knowledge about which regions have the highest internet usage communities.

Keywords: Availability, Accessibility, Coverage

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DEDICATION

I dedicate this to God Almighty, for His grace, love and above all the unique favors

1 Introduction

This research is on the request of “Viope Solutions”. Viope Solutions is a comprehensive eLearning company. The company desires to have a visible representation in Ghana, providing the aforementioned service to educational institutions as well as to individuals.

Other materials were collected from the country’s communication ministry and the national communication authority annual reports.

Viope Solutions Oy wanted to obtain independent prior knowledge of which Internet provider could be the most reliable in Ghana, and which region has the highest proportion of Internet users. Availability, accessibility, and coverage will be the index to use in measuring the internet services provided.

1.1 Background of the study

In the coming chapters, the research will attempt to contemplate the theory in practical terms to find out how reliably internet service is in Ghana and by which internet service provider. The study will find out from independent yet key people who use and understand internet connections in its bandwidth and its Mbps. The above set the stage as descriptive background.

The index to measure the reliability will be narrowed to Availability, Accessibility, and Coverage. This index will aid the researcher to have an objective and impartial analysis. The final part of this work included recommendations, which were from the test results computation the writer found.

Since this research is being carried out from an angle of an independent customer, actual customer satisfaction is real.

The methodology of the study will be locational testing, interactions with key industry players’ questionnaire for internet users asking about their satisfaction or dissatisfaction levels. Appendix, Figures Illustration, Tables, and Pictures, were used to give a more pictorial-view and aid schematic understanding.

1.2 Research Context

The researcher was chosen mainly due to his background of having had five to six months industrial training (Internship) in the telecommunication field in Ghana and as a final year stu-

dent on a Business Information Technology programme. The writer and the vendor were highly interested in exploring the prevailing internet connections for business in Ghana.

The writer had participated in some meetings and test connections of internet links during his internship period, which improved the value of information collected from key industry players. This provided additional value and greater computation of the study results.

Since the vending company Viope Solutions Oy, wanted to have a visible representation in Ghana, providing eLearning services to educational institutions as well as individuals who may need to learn, there is the need for them to be aware and understand the prevailing internet connections and its reliability for business in Ghana, since it uses internet to reach its customers.

1.3 Objectives of the study

This study is to find out how internet services in Ghana is reliable as in terms of its availability, national coverage. More also, the study was to study the prevailing internet connections in Ghana and evaluate their reliability for commercial purposes.

To be able to say which regional location is best in setting up a business which uses internet connections to reach its customers.

Lastly, this research will find out other options that can be arranged for internet connections for business in Ghana.

After the research, the vendor will like this document to independently, say that Internet Service Provider “A” or “Z” is well placed for a possible partnerships (Providing internet service for “Viope Solutions” in Ghana) based on the research results.

1.3.1 Structure of the study

The table below illustrates how the study and final work was organized

INTRODUCTION	✓ Background of the study
	✓ Choice of research

context		
	✓ Objectives of the study	Chapter 1
	✓ Structure of the study	
	✓ Limitation of the Study	
THEORETICAL BACKGROUND	✓ History of Internet in Ghana	Chapter 2
	✓ Internet networks in-frastructure	
INTERNET SERVICE PROVIDERS IN GHANA	✓ Prevailing internet companies	Chapter 3
	✓ Arranging internet for Businesses in Ghana	
METHODOLOGY OF THE STUDY	✓ Data collecting	Chapter 4
	✓ Data validating	
	✓ Data analysis	
EMPIRICAL STUDY	✓ Development expectation for the company in Ghana	Chapter 5
	✓ Viope Solution Oy - The Vendor	
CONCLUSION	✓ Findings	Chapter 6
	✓ Recommendation	

Figure 1 Structural view of the study

1.3.2 Limitations of the study

Arguably the most difficult question during the research was how reliability can be evaluated in an internet connection in Ghana, be it on the Digital Subscriber Line or the Dialup connec-

tions Networks. (Also, Satellite, Fiber-optic and Cable) Sub to that was on what device is the internet being transmitted, how composite is the device to receive the internet waves from the transmitting end.

Lastly, there was limited resources to travel across the whole country, hence it was decided that the research be carried out in the south where most businesses and tertiary institutions are located.

1.4 The vending company

Viope solutions Oy, is a comprehensive eLearning company with expertise in computer programming, mathematics, Viope Recruit (TBA), Viope Platform (TBA) and other eLearning tools for educational organizations, corporate bodies, professionals and individuals. Viope solutions Oy, focuses on making Information Communication Technology activities easy and effective.

Viope product benefits for its customers are the automatic and immediate feedback about the exercise. The customer can browse a theory related to a single chapter, multifaceted exercises, compliers and interpreters in the web browser which offers customers an easy way to share their thoughts about course contents and completed exercises. Viope products allow corporations to use VPC, so that they can test the skills of their new employees, as well as for mandatory training for optimal training. Private individuals also use VPC for self-learning.

The company sees Ghana as a prospective market hub in the near future, providing aforementioned services to educational institutions as well as individuals who may find the need to learn programming.

2 Theoretical Background

2.1 A brief history of the internet in Ghana

According to the National Communication Authority, internet became visible in Ghana in the late 90s. It was pioneered by the first three internet service providers. In this sequence, they were on the market respectively Network Computer Systems, Africa Online and Ghana Internet Service. Common among these companies was the used of the three known protocols. (Internet Protocol Suit, Simple Mail Transfer Protocol and Unix-to-Unix Copy

There used to be only (store & forward) email providers namely; Fido net, Health net and AAU. These companies download mail from external gateways a maximum of 3 times daily. Speeds of 19.2kbps were quite normal - speeds of 28-31kbps are also not uncommon. All the providers have leased circuits from Ghana Telecom at 64kbps. National Commission Authority had two satellite dishes (128kbps) for inward and outward traffic bypassing the Ghana telecom system.

At present, the internet service in Ghana utilizes standard interfaces, which has minimal, impact on the existing network and requires no changes to the cellular network. Operators have enjoyed progressive growth for the past 5 to 10 years due to the advancement in mobile technology and the greater growth in internet literacy "in the country", Because of the Mobile technology substitution for the traditional fixed line internet connections, These fixed lines operators have provided a way to add a wireless service to their component service bundle, giving them a competitive advantage in their effort to keep-up and grow their customer base.

2.2 General overview of the status of Internet Connections

Cognately, internet status in Finland is by far better as in availability, speed, accessibility and bandwidth as to Ghana. It was observed that the internet usage community in Ghana keeps an upward growth daily with Schools, Universities, Non-governmental organization and private persons connecting to internet into their offices and homes. Businesses were the majority of the internet usage communities in Ghana, and most ISPs provide a discount to business. But, most of these internet usage communities are in the capital and some few regional cities. Ghana telecom operators of Vodafone Ghana have almost services centers (Care4U) across the country providing internet connection assistance to customers.

Since Ghana telecom (Vodafone) is as well an infrastructure provider, it has enormous infrastructure in all the ten regions of the country for which reason almost all the Internet Service Providers uses the infrastructures of Vodafone (although it provided by a subsidiary company) to connect to other regions.

According to the ministry of communication news report, the Government of Ghana is investing in a project called the centralized services portal that would empower the public to have easy access to government services online, therefore, the level of internet service and its usage will become more and more relevant.

Subjectively from the study so far, it can be deduced that internet status in Ghana is a little over average and the future looks bright. People or businesses connect or link their services online for publicity just as private individuals will pay to have internet in their homes to learn read or surf the net.

The cost of internet in Ghana varies depending on which service provider one use. On average, a monthly subscription of fee of € 23 (euro's) (50Ghc) per home and some internet cafes charge €1 every 2hour web usage. (0.50gch per hour)

2.2.1 Service providers national coverage

Majority of the service providers has latest broadband technologies such as Next Generation Networks, Base Transceiver Stations, Ultra-modern Switches and Base Switching Centers all across the country although this research results shows that none of the service providers has reached a 100 percent nationwide coverage.

The equipment and infrastructures owned across the country by telecommunication companies, providing data communications (if is anything to go by) showed that transmission of calls and data on their systems will enable backbone thereby providing high-capacity transmission line as well as the submarine cable and the nationwide fibre-optic ring cable.

Vast majority of the Internet Service Providers operates on state-of-the-art network that is dimensioned technically to offer seamless connection, which can guarantee high quality data network service that is relatively stable to any network in the world.

2.2.2 Network infrastructure of service providers

Internet Service providers in the country have adequate Telecommunication Infrastructure systems across the country which with a larger amount of these infrastructures visible in the cities, although many rural communities are yet to be connected, expansion of the services is slowly taking form. Ghana telecommunication Ltd (Vodafone) is the only licensed and owner of the PTT in Ghana. Therefore, it has a monopoly, and owns a large proportion of Telecoms infrastructure in the country presently. Asynchronous Transfer Mode (ATM), transport technology is the network backbone based of the company it also uses the microwave intercity fibre and the fibre run by Volta Communication (Votacom) a subsidiary company of Volta River Authority (VRA) which run along Accra via Kumasi, Nkwakaw, Winneba, Cape Coast and finally Obuasi. These fibre networks are access via the copper cables and currently cover the fifteen major cities and towns all in southern Ghana.

The Government of Ghana under the Ministry of Communications has contracted a leading Chinese telecommunications equipment manufacturer, Huawei Technologies, for the construction of an inaugural phase of a nationwide e-Government infrastructure for Ghana. This

should go a long way in improving the telecommunication infrastructure of the country thereby making internet more reliable and technically advanced infrastructure community.

Under the agreement approximately, fifteen towns and cities will have WiMAX coverage. The network will be built on an IP backbone that will consort over the infrastructure of the National communications backbone company (NCBC) the subsidiary of Vodafone Ghana, which manages the national fibre optic backbone infrastructure. According to Huawei technologies the IP backbone will first operate at a speed of Gigabit Ethernet, and ought to endorse a straightforward expansion to 10 Gigabit Ethernet speeds.

The National Communication Authority has granted licenses to many Internet Service Providers to operate their own international satellite gateways. The ISPs build their own networks within Ghana by providing access to other regional capitals using a combination of VSAT, microwave and fibre optic connections for their backbone connectivity. It was clear that, the dial-up services offered by some of the Internet Service Providers through the old copper cables of Ghana Telecom, gave subscribers extensive network of telecommunication infrastructure to choice.

The above notwithstanding the research discovered that almost all the service providers have invested substantially in telecommunication infrastructure equipment providing access to the internet via a number of undersea fiber-optic cables, wireless radio, VSAT and etcetera.

According to a study done by Hewitt Associates a “Ghana has compelling list of assets including a stable and sufficient IT infrastructure, a well-educated English speaking population and, especially with the arrival of SAT-3/WASC.”

2.3 Scale of quality

“Quality/Reliability refers to the degree of consistency with which instances are assigned to the same category by different observers or the same observer on different occasions”. (Hammersley 1992 in Silverman 2001, 175) The purpose of setting a quality benchmark in this study was to minimize biases, errors and define a path for this study.

In order to be consistent in this study, three indexes were used to measure service quality with all the mainstream (major) ISPs. (Availability, coverage, and accessibility)

Benchmarking (Index) according to Kotler & Armstrong 2004, 570 is the process of comparing a company’s product and processes to those of its competitors or leading firms in other industries to find ways to improve or measure the quality and performance.

2.3.1 Service availability

In telecommunication settings, also in reliability theories, and for the purpose of this study, availability was defined as the coherence of time a system is in functioning condition. This study wanted to know how available an internet service is, and to the customer within the time he or she needs it.

Travelling, testing service and having interviews with customer showed that the country Ghana has accessible internet.

The study results showed, almost all the cities in the southern Ghana have internet from one service provider or the other. The Mobile telecoms have taken internet to remote areas, wherever you can receive a signal (antennal on the phone) then it highly possible to have available GPRS service by the service provider.

Scancom Ghana, based on this research results had most mapped cities, making it the widest covering network in providing internet service for the distant cities. Vodafone Ghana and Millicom Ghana follow in that order, but the traditional internet service providers were not that visible in these distance cities of Southern Ghana.

Across the southern Ghana, it was seen that there were government provided community information centers, which has internet, available in these centers most of which were connected to Vodafone fixed broadband. These community information centers serve as database and information center for the local.

Writing from a telecommunication point of view, one can conclude that internet availability in Ghana is certain since almost everywhere visited and people interviewed showed that the internet is everywhere you go, although availability cannot be one hundred per cent in a reliability theory.

2.3.2 Service coverage

The continual upgrade of systems and infrastructural seems to be the focus of the major service providers in the country thereby increasing their service coverage over the country. Most of these service provider relay hugely on towers or communication mast (See fig 2 below) to receive and allow transmission of data.



Figure 2 Communication Tower

It was observed that almost every part of the country had some amount of internet coverage provided by at least of the ISPs. In Accra, where the majority of internet service providers has their base stations, and a larger number of businesses, organizations and universities are located the coverage was over 90%. Greater percentages of customers or people who patronize internet in Ghana are the business entities. Therefore, it was not surprise to see that, comparably the coverage in Accra was good, and there is good network coverage in isolated spots of Accra.

In as much that it was clear that service coverage of most of these providers was wide, there is the need to have a good, compatible device to have strong signals in remote cities in other part of the country. Everywhere one goes, be it urban center, city center or far distant places there are internet coverage, although with some few cut-offs occasionally.

2.3.3 Service accessibility

The degree to which internet is readily accessible to as many people (who needs it) as possible at any given time marked the lines as to how this research measured accessibility.

Internet accessibility in Ghana, on the bases of the above definition, it was clear that in as such as it was growing in cities same cannot be said in rural or distance areas of the country.

In most remote places or places not close to the city center internet as virtually, not in reach. Although there are educational institutions in these remote places same cannot be said

of internet. The advancements in the country's Internet sector appear to be focused largely in Accra and a relatively few urban centers, severely limiting access to the Accra.

Inasmuch as internet Service Providers' is concerned with monetary value they are not interested, in places where their investments will not march their returns. In cases where Internet Service Providers and Mobile network operators (3G) are ready to expand their services to these remote communities, there is an ascetic lack of equipment.

Less people in faraway communities own computers and power outflow is absent or problematic. Hence, download and upload speeds are slow, and Internet users face breaks in their connections. Broadband connections via satellite do not always measure to their hype.

Telecommunications, offering mobile broadband is slow in extending their 3.5G coverage to rural areas, fearing lost in revenues. Base on the above and other unseen factors Internet access is obtuse to potential users and comparably inaccessible in places other than the city centers.

Internet accessibility in Ghana today can best be describe as the cities has it all whiles the rural communities are catching up. On the average, internet accessibility in Accra is higher than it is in other cities. This research results showed that mobile broadband is dominant in the internet user communities across the cities as well as the rural or distant places.

3 Internet service providers in Ghana

3.1 ISPs

Internet Service Provider is a firm that gives subscribers (customers) access to the World Wide Web. Internet Service Provider conserve large runs of cabling and keeps up the network services in order to transfer and deliver web content to those customers paying the subscription fee. Commonly, internet service providers focus on DSL, Cable modem, wireless and recently, dedicated fast interconnects example is the fiber optic service. This case is not far different from the prevailing internet services in Ghana.

Statistics available from the National Communication Authority has it that there are more than 50 VSAT networks operating in the country. Almost 100 different Internet Service Providers (ISPs) were sanction in 2004 alone, bringing the total to 150 as at August 2012. It also stated that only a little over thirty of these service providers are operational. Broadband ADSL services were present in 2003. This research established that the following ISPs are the major and active internet service providers in Ghana and the services they provide. (See fig 4 at page 22 for some of their packages)

3.1.1 Vodafone Ghana

Vodafone in Ghana is a subsidiary company of Vodafone Group Plc. Vodafone is communications solutions provider - mobile, fixed lines, internet, voice and data. Vodafone Ghana operates both fixed broadband as well the mobile modems.

3.1.2 MTN Ghana

Scancom Limited, the foremost company in mobile telecommunications in contemporary Ghana. MTN Ghana enables high speed Internet access through their integrated network of HSPA, HSDPA, HSUPA, 3G and EDGE technologies.

3.1.3 Glo Ghana

Globacom Limited is Africa's fastest growing telecommunications company. Glo Ghana is a subsidiary of Globacom Limited, Nigeria. It recently has launched a fiber optic cable that will deliver high speed, reliable and cheaper Internet and telecommunication services to the Ghanaian community.

3.1.4 Tigo Ghana

Millicom Ghana Limited is a subsidiary company of Millicom International. Tigo Ghana enables high speed Internet access through their integrated network of HSDPA, HSUPA, 3G and EDGE technologies.

3.1.5 Teledata ICT

Teledata ICT provides communications solutions that align with business strategies. They offer a portfolio of cost-effective, high-performance Broadband Internet access, IP VPN, Wide Area Network connectivity, and VoIP solutions. They also provide domain Registration and Hosting services.

3.1.6 Ecoband Networks Ltd

Ecoband Networks offers terrestrial broadband wireless links using open-mesh Wi-Fi, Canopy Advantage and CDMA technologies for TCP/IP data connectivity. Ecoband Networks utilize the broadband DVB-2, SCPC and VSAT technologies.

3.1.7 UCOM

UCOM is Ghana's Premier Internet Application Service Provider (ASP), providing a One-stop-shop for Communications Services and Solutions.

3.1.8 NetAfrique Dot Com Ltd. / Mobile 2i

Mobile2i is a business department of NetAfrique Dot Com Limited, One of many providers of broadband and Internet-related services and data communications services in Ghana.

3.1.9 My Zipnet

Broadband Home Ltd (BBH) is among Ghana's premier internet service providers. A privately held telecommunication company, BBH is an impeccable choice of internet Service Company in terms of quality of service delivery.

3.1.10 Enterprise Solutions

Zipnet has quality Internet services for businesses and private persons ranging high speed Broadband internet services to IP VPN/WAN.

3.1.11 K Net

K-NET started out as KCS Ltd, as installation and maintenance of computer hardware systems and accessories.

3.1.12 IBurst Africa

IBurst Africa IBurst Africa uses current technology to deliver mobile broadband, internet services. IBurst Africa has been operational as a wireless Internet Service Provider in Ghana. IBurst Africa offers the speed of DSL in a mobile environment.

3.1.13 Airtel

Airtel Ghana Airtel Ghana is a subsidiary company of Bharti Airtel Limited. Airtel provides 2G, 3G and 3.75G services depending on the region or city of its operations and the infrastructure available. The company uses internet protocol access network also known as mobile backhaul, across the country to aid internet access at a faster speed and high quality internet browsing on mobile handsets, and on its modems.

3.1.14 Espresso

Espresso Ghana Espresso telecom operates high speed network over 3G and 4G. Espresso, support HSPA mobile broadband, and currently the only I.S.P deploying CDMA 2000 networks, to bring internet and voice services to rural communities.

3.2 Fibre optic cable in Ghana

The advancement of fibre infrastructure for interior demarcations of Ghana to provide a high speed backbone is supplied by the National Communications Backbone Company, (NCBC) which Vodafone, Ghana is the parent company which has approximately 1,335km of optical fibre network connecting over twenty three (27) sites nationwide.

Scancom (Mtn) and Millicom (TiGo) are also building a fibre network with surplus rings across the Ghana. Glo Ghana is also setting-up optical fibre across the country to connect-the-dots into their undersea cable. These fibre networks will deliver a decent national fibre backbone for telecommunication companies, ISPs and broadband operators. In a related development, the country is currently being served by four international submarine fibre optic cables and more space to update, which is bringing down prices for broadband internet access.

Lately, investments made across service providers in the voice/data communication in Ghana, points to, a brighter future in terms of fast internet service. Globacom being the recent to add up to the Internet Service Providers seems to be aware of the market demands and has launched a fibre optic cable. That it says will deliver high speed, reliable, cheaper Internet and telecommunication services to its subscribers than other service providers. They are laying 9,800 kilometer cable, from Lagos, Nigeria which will connect Ghana to the rest of Africa, Europe and the rest of the world.

Mr. Adenuga, the CEO of Globacom is quoted as saying the fibre optic capacity in Ghana was 120 gigabytes per second and indicated that with, the emergence of the submarine cable, the capacity would increase to 640 gigabytes per second and an eventual capacity of 2,5 terabytes per second, "consequently increasing up time reliability to 99.9 per cent". Furthermore, The West Africa Cable System (WACS) with a planned capacity of 5.12 Terabits per second is also in the pipeline to be operational in Ghana according to a ministry of communication report.

3.3 Communication masts in Ghana

The question that comes up is what communication mast is and why the need to talk or write or more so finding out about it in reliability studies of internet in Ghana.

Communication masts are the traditionally tall mounted poles to physically hold or support antennas typically at the top of the mast.

Communication Masts are used to transmit waves, data and many more. A mast typically transmits and receives data. It may be short or long (See fig 3 below)



Figure 3 Communication Tower

Communication mast was included in because it was observed that depending on how far or close one is from it may have an impact on the data quality and speed of the internet. So in Ghana, based on the closeness to these devices one may receive a clear faster data service and have less delay as compare to one who may be a few more kilometers away from the mast. (See also why it was include at the recommendation chapter)

The write observed that there are a lot of communication masts across the country and between every five to ten kilometers you are bound to come across a communication mast servicing both the internet service providers and telecommunication companies, As well as television houses.

3.4 Different options arranging an Internet connection for business, in Ghana

The internet service in Ghana today can best be said to have a vastly liberalized market, with the majority of these providers haven the gut edge business models approach to entice organizations.

Their service draws customers that require relatively reliable and stable internet to keep their business going. Since the majority of these Internet service providers have invested essentially in providing internet access via a number of undersea fiber-optic cables, they have developed in a number of redundancies and reroute options in the network for this service,

this ingeminate into high availability levels of the network to the advantage of the client base.

The available capacity is important to provide for a high number of customers requiring dedicated internet access services which is mostly suitable for online services companies, internet service providers and web development companies.

This research established that each of the Internet service providers seem to understand that each business needs is unique to the said company.

Therefore, Internet service providers have tailored made solutions or offers to meet the need of the requesting company. Almost all Internet Service Providers offers a range of relatively reliable internet service, and innovative products and services intended specifically at businesses offering online services companies and other businesses that may require such service at mostly undisclosed prices. (See fig 4 below for ISP offers)

Internet Service Provider	Bundle/ Offer		Download (Kbps)	Data Restrictions Limit	Monthly Charge (Euros)	Charge per Mb	Initial Fee Euros	Usage period	Device (e.g. Mo- dem)
ECOBAN D	Private Broad band.	Submarine fiber op- tic service	1000 1030-10,000	Unrestricted Unrestricted	30 500-5,000		80 500		All inclu- sive
Zipnet	Nitepack		512	Unrestricted			35		307
	Bronze		512	Unrestricted					
	Silver		768	Unrestricted					
	Gold		1024	Unrestricted					
iBurst	Go 100		1000	100	4	0.50		31days	UUSB Modem 50/ Desktop Modem 120
	Go 220			220	9	0.48			
	Go 600			600	21	0.40			
	Mega Data 50			2,000	9	0.15			
	Mega Data 100			5,000	45	0.11			
	Mega Data 200			12,000	97	0.07			
Teledat a	Internet Lite		192	Unrestricted	28		112	12hrs 07:00 19:00	All inclu- sive
	Internet Pearl		265	Unrestricted	112				
	Internet Silver		320	Unrestricted	133				
	Internet Gold		348	Unrestricted	190				
K-Net	Premium		1,000	Unrestricted	305		140		500
	Gold		2,000		500		140		500
	Wireless		2,512		817		691		Sold ex- ternally
TiGo	Per MB		921	Unrestricted		0.50	3.09		21
	Daily bases		921		1 daily		41		
	Monthly Subscription		921		18		2		
Mtn	300 MB		3,600	300	4.3	0.10		30days	

	2.5 MB	3,600	2,500	18	0.07		30days	
	4.0 GB	3,600	4,000	27	0.05		30days	26
	6.0 GB	3,600	6,000	38	0.04		30days	
Voda- fone	'Pay As U Go'	512				21 21		
	One wk. session	512	150	2	0.09		7days	21
	One mnth. Session	512	750	7	0.07		30days	21
	Home starter	256	10,000	22	0.11			21
	Fast & Reliable	1,024	60,000	98	0.08			43
	Heavy User	4,000	100,000	139	0.02			43
	Anywhere	4,000	250,000	180	0.02			43
Express o	CliQ As U Go	1800	Unrestricted		0.22			
	CliQ a day	1800	100	0.80	0.09		1day	
	CliQ	1800	1,000	7	0.07		33days	26
	CliQ Regular	1800	4,500	21	0.06		33days	
	CliQ Premium	2500	6,500	37	0.06		33days	
	CliQ Gold	3000	12,000	50	0.04		33days	
Airtel	'Pay As U Go'	3600			0.11			21 or
	PC daily User	3600	30	1.20	0.06		1day	
	Lite	3600	1000	13	0.04		30days	65 for
	Extra	3600	4000	26	0.02		30days	pocket
	Package1	3600	12000	50	0.02		30days	router

Figure 4 ISPs offers for customers (Business)

Among the list of offers and packages for business entities, that of Teledata (An ISP) was comparably better. Offering comprehensive communications solutions, that aligns with business strategies. They also offer a portfolio of cost-effective, high-performance Broadband Internet access, IP VPN, Wide Area Network connectivity, and VoIP solutions.

4 Methodology of the study

4.1 Research method

The research method adopted in this work was a case study method, and by its settings it was an analytical, reliability one and testing. One cannot either rule out that in some instance there was an element of investigating when it comes to testing.

In a reliability research (and as in this case) the objectives are to seek answers to a question that cannot be answered only by correct or wrong stings. In reliability or qualitative research a framework is constructed based on an existing theory, followed by describing and analyzing a case example or examples. After that, the conclusions are made, and the new theory is created. The advantage of this method of research is that it gives an in-depth result, but it also makes or leaves the results in a little hard line to measure. (McCarthy & Perreault 1993, 154-155)

4.2 Research validity

According to Hammersley 1992, Reliability refers to the degree of consistency with which instances are assigned to the same category by different or the same observer on different occasions. However, in reliability investigating, the researcher himself is the main research instrument, and therefore the research can hardly be wholly consistent and replicable. Although, the investigation could be repeated by other researchers, they would unlikely to achieve the same results even in similar circumstance and conditions. This is because the researcher's own background influence that the researcher sees and how he or she reaches a conclusion (Daymon & Holloway 2002, 90)

"By validity I mean truth: interpreted as the extent to which an account accurately represents the social phenomena to which it refers". (Hammersley 1990, 175)

This research was conducted with much awareness of care, deeper understanding of the prevailing data communication environment in Ghana hence settling on the choice of method. Maximum amount of systematic errors were avoided. The validity of this work was much enriched because key industry players and technical minds were involved in the final results computation and the recommendations. Since there can never be 100 per cent sure of anything in statistics, there is always a chance to be wrong, there is a 'probable' in probability, not 'certainty'. (Sauro & Lewis 2012, 288)

4.3 Data collection

The collection of data was through multiple sources. Since it was a study format thesis, an open mind attitude of questionnaire (See Appendix 1) was adopted, asking how satisfy or dissatisfy a customer is, had interviews, interacted with people who have the technical know-how in the telecommunication industry in Ghana, read more from the service providers website and when it was possible travel to other part of the country to experience or test how internet is accessible in that geographical location, the latter was done by the help of a local agent in Ghana who went to five regions out of the ten regions. About seventy per cent of the results are based on the test results and the answers from the questionnaire. The remaining twenty was from the interaction and interviews.

Furthermore the interactions and quit observation of the writer also supported the data collection since the writer working (Internship) for five months in Ghana within the telecommunication industry (Millicom Ghana.)

Finally data from government agencies, departments were used.

4.4 Data analysis

The method adopted in this study in analyzing the data collected was to bring out only the useful information, findings and the conclusion of how internet is reliably and by which operator. Since in case study it paramount that there is theoretical framework to guide the data collection and analysis process. Much of the analysis was conducted by theoretical support.

Since vast majority of Businesses, higher educational institutes are in the Southern part of Ghana, and for the fact that there was some level of scares resources, it was decided that the southern Ghana will be the concentrated area. In this case Greater Accra Region, Central Region, Western Region, Ashanti Region, Eastern Region and Volta Region. (See fig 7 for regional mapping of Ghana)

5 Empirical study

5.1 Current company situation

Currently, the mainstream of customers for Viope Solutions Oy, are based in Finland, Estonia and Holland. The company has been providing to the educational institutions in these countries the fundamentals of programming in Mass courses approach, which reduces the burden of the lecturer and the student to travel miles to where the institution is located.

Currently as mentioned earlier, the company desire to have a visible representation in Ghana, providing same services to educational institutions as well as individuals who may fine the need to learn, Hence the need for them to be aware and understand the prevailing internet connections and its reliability for business in Ghana.

5.2 Possible business options for Viope whiles in Ghana based on the empirical finding

The company may consider liaising with tertiary educational institutions in the country, which provide programing courses. There are a number of these institutions the writer went further to ask how reliable their internet links were and will it be okay if there is an independent party who will have most of the programming course taught online. Their response was affirmative. Valley View University and NIIT are two of such institution that a possible deal is likely.

Lastly, it will be beneficial to Viope to request from Interment Service providers in the form of liaising for the internet service provider to increase its reliability and speed link in a geographical location which it has more customer base. The expectation of the company and its shareholders may affect the purpose and what it may consider as possible develop in response

to Ghana as it is an emerging market. This notwithstanding, as (Johnson & Scholes 1997, 197) says stakeholders analysis is most useful when relating to an assessment of specific developmental goal such as introduction of a new product in a new market area.

6 Conclusion

The conclusion contains the writers' summary based on the research results and internet usage community satisfaction level that were collected (data) with the open questions *(See Appendix 1). The main findings are discussed and used as recommendations in this chapter.

The outcome of this study shows that all internet service providers are almost on level grounds regarding accessibility, reliability and speed. On the other hand, Vodafone in conclusion, is reckoned to be the most dependable Internet Service Provider in Ghana primarily because of the fact that they have the widest service coverage as outlined by the research results.

This research results also shows that Vodafone are the leading and widely used and the most reliable internet service in Ghana covering over 60 %, (Dial-up connection and Mobile broadband) of total internet service in Ghana. More so, almost all other service providers take their backbone from Vodafone.

Though Vodafone also have some level of short falls in some of the hinterlands, where internet service in general is very much unstable like the eastern region where there are mountains, per the results Vodafone Ghana are the most stable and reliable internet service providers in Ghana today based on the research results.

The evidential infrastructures facilities (undersea fibre optic and) across almost all the service providers, and investment from the Government into information communication technology sector mean Ghana conceivably could be at a very different stage of accessible, reliable, and high speed internet service across the country in the next few years. Provided that the infrastructure and technological investments boom is managed effectively.

Lastly, availability of quality telecommunications infrastructure which would aid access to low cost and relatively reliable internet services including fixed, mobile broadband and 3G was evidential across the southern belt of Ghana where this research took place.

6.1 Findings

This research results were obtained by analyzing the test data collected between August 01, 2012 and October 14, 2012. Twenty-five key personals in the telecommunication industry plus locational testing personnel, before the final index computations were reached.

According to the research index, Accra was the first place with 4.49Mbps, Central region was second with 3.51Mbps, Volta region was third with 3.11Mbps, and Ashanti Region was Fourth with 3.07Mbps while Western and Eastern Region were on the same level with 2.08Mbps, approximately. (See fig 5, usage community) & (See fig 7, regional map of Ghana) Times of the day that one tries to access the internet may effect of speed or otherwise of the service. Positioning of the device to receive the transmission is a variable that plays a significant role in the data accessibility and its availability. (See fig 6, for regional usage)

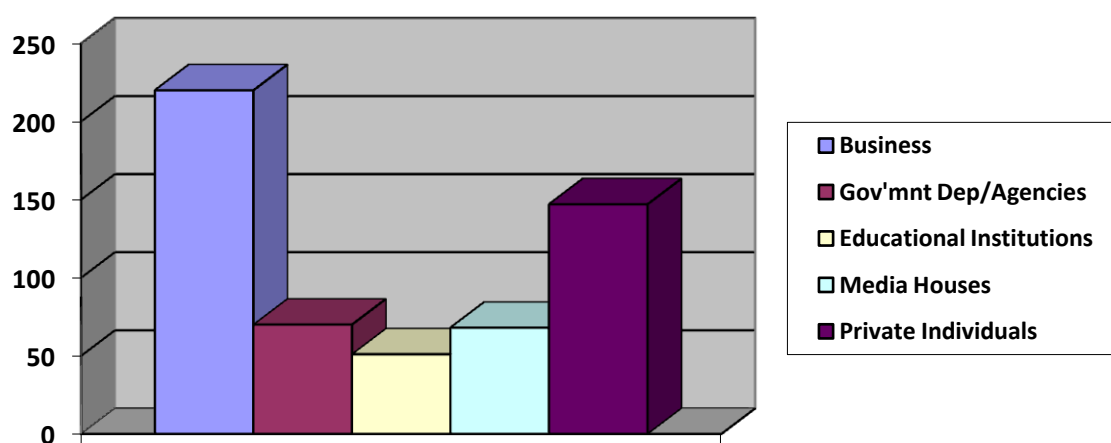


Figure 5 Internet usage community

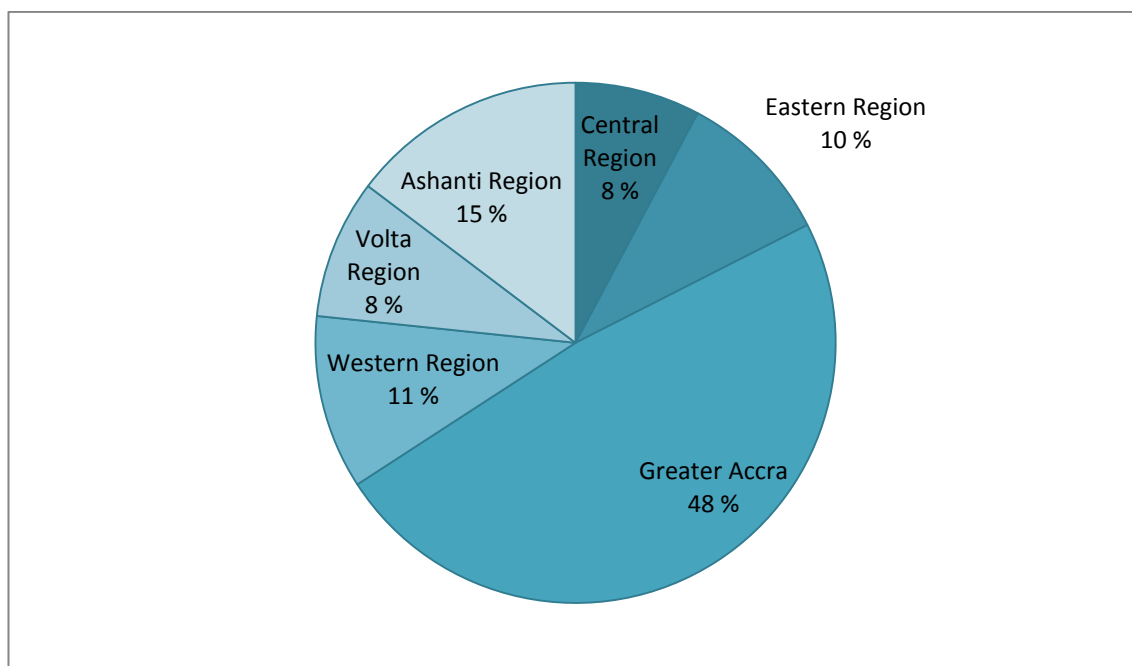


Figure 6 Internet users by Region (Southern Ghana)



Figure 7 Regional map of Ghana

Between the telecom operators in Ghana, profess, tested and vilified broadband speeds range from 3.1Mbps (Espresso) to 14.4Mbps (Vodafone). Depending on where one stands and at what

time of the day. Majority of the places in Accra visited and tested points places Espresso ahead of the other ISPs.

Vodafone Ghana had 5.79 Mbps, based on test results and; Broadband Home Ltd (BBH) Home Ltd had 2.82 Mbps, and Scancom Limited (MTN) has 2.34 Mbps, Millicom Ghana (TiGo) had 1.15 Mbps and they constituted the vast major of the Internet service providers (ISPs) in Ghana. (See fig 8, research reliability index)

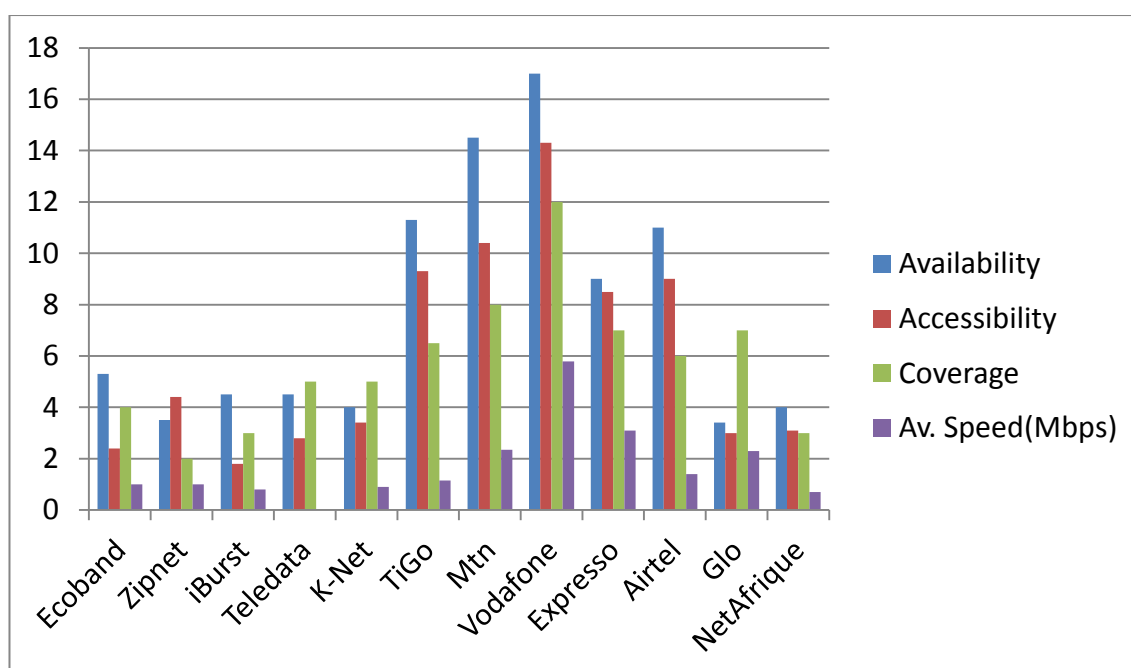


Figure 8 Internet service providers' reliability index

In the modem internet market, Vodafone is the market leader with 49%, MTN (23%), TiGo (16.2%), Airtel (8%) and Espresso has 1.8%. Fixed Network operators hold the remaining 2% subscriber base. (See fig 9 below)

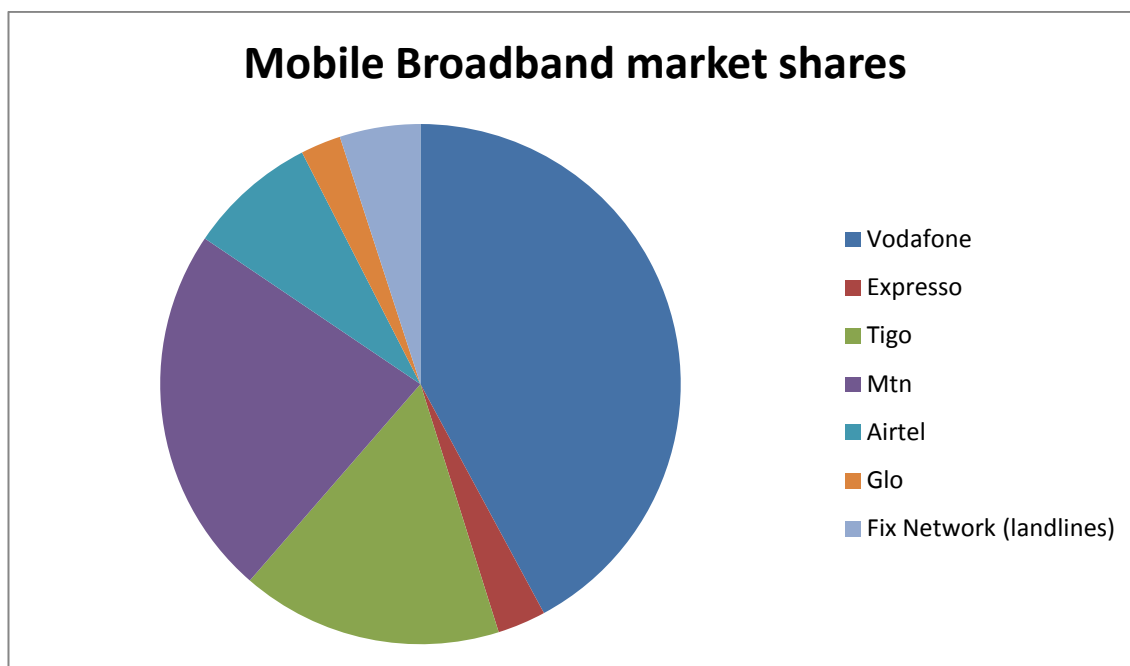


Figure 9 Modem Internet market shares

6.2 Recommendations

The following recommendations are based on the theoretical background which was established in this thesis and by analyzing the research results, the internet services environment in Ghana as well as the analyzing the empirical findings of Viope solutions Oy.

Viope Solutions Oy must be strategic. The marketplace of eLearning in Ghana has a long way to go; therefore, they can take the lead and champion the course. Brennam, Baines, and Gerneau (2003, 12) stated that strategy is concerned with strategic decision-making. Four characteristics of strategic decision were identified. One was Strategic decisions are concerned with the long-term orientation of the Organization. Two was Strategic decision define the scope of the organization's activities and select what it will do and what it will not do.

Thirdly, Strategic decision should be marched to the organization's external environment and finally it talked about a strategic decision have to be matched to the organization's resource capacity.

Viope Solutions must deploy tools to monitor and control the use of bandwidth. This is because it was notice that Internet Service Provider may fall below agreed terms. Claims can, therefore, be made to providers, concerning the bandwidth that is delivered as against the

amount that has been contractually agreed. Monitoring bandwidth use is vital to optimize and ascertain usage during the 24-Hour availability of the connection.

A good downlink and uplink tracking or enhancement tool at the server station may help the internet speed as well as the time spent accessing the server.

Because, the writer observed that there are a number of communication masts in the country, which when one is closer to it, it helps internet speed such as decreasing the amount of time in receiving a document, on the internet. Hence it recommended that, when VIOPE is considering a school or a business partner in other than the cities it tries to locate closer if possible to the nearest mast.

The company may consider having between three or five persons who can and have the technical know-how to bargain for them in terms of getting the best price plus bandwidth for the internet service from the provider that will be appropriately tailored made solutions meet the demands and standard it requires since most of these service providers give according to the demand of its clients.

It is essential, that Viope Solutions develop a set of standards metrics to determine whether they are successfully getting the internet service they are paying and are required to get.

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Appendix 1: Questionnaire 1 A, B, & C

A. Questionnaire on Availability

Do you use the internet?

Yes/No

How often do you use the internet?

Once a week / daily user / once in a while

If yes, what are the main sources of internet for you?

1 modem 2 broadband

Who is your internet provider?

Is your internet link reliable every time of the day?

Is the internet available all times for your use? Yes/No

Will you recommend your internet service provider for a third party based on its availability?

Yes/No

B. Questionnaire for Accessibility

How often do you use the internet?

Once a week/ daily user / once in a while

Are you able to access your internet in your comfort zone?

Yes/No

Where do you get it?

1 internet café, 2 modem, 3 office broadband

If through the café do have to travel?

Yes/No

If yes, for how many kilometers?

A. 1km/ B. 2km / C. 3km and Above

Which internet service provider was easy for you use to access the internet?

Would you say the internet is accessible all times?

Yes/No

Will you recommend your internet service provider for a third party based on its accessibility?

Yes/No

C. Questionnaire on coverage

Where do you get internet the best?

1, internet café 2, modem 3, office broadband

If through the café do have to travel?

Yes/No

If no, do you get internet service everywhere you go?

Yes/No

Are you able to get internet coverage on your modem in remote places?

Yes/ No/ Sometimes

Based on your internet service providers coverage when you away from your city, will you recommend your ISP to a third party?

Yes/No