EXPLORING THE PERCEPTIONS OF NETWORK MANAGERS ON BANDWIDTH AND ONLINE VIDEO STREAMS IN AHMADU BELLO UNIVERSITY, ZARIA.

IMOISILI OJEIME ODIGIE
MSc/EDUC/21580/2012-2013

DEPARTMENT OF LIBRARY AND INFORMATION SCIENCE
FACULTY OF EDUCATION
A.B.U ZARIA

DECEMBER, 2015

EXPLORING THE PERCEPTIONS OF NETWORK MANAGERS ON BANDWIDTH AND ONLINE VIDEO STREAMS IN AHMADU BELLO UNIVERSITY, ZARIA.

IMOISILI OJEIME ODIGIE
MSc/EDUC/21580/2012-2013

BEING A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY, ZARIA. IN PARTIAL FULFILMENT FOR THE AWARD OF MASTER DEGREE IN INFORMATION SCIENCE, DEPARTMENT OF LIBRARY AND INFORMATION SCIENCE
FACULTY OF EDUCATION, A.B.U ZARIA.

Dr Ibrahim Yazid

Dr Ezra Gbaje

DECEMBER, 2015

DECLARATION

I **IMOISILI OJEIME ODIGIE** with Registration Number M.SC/EDUC/21580/2012-2013 hereby declare that this dissertation entitled "Exploring the perceptions of network managers on bandwidth and online video streams in Ahmadu Bello University, Zaria" is a product of my research work and is original. Authors whose works were used in this dissertation have been duly acknowledged.

_____

IMOISILI OJEIME ODIGIE
M.SC/EDUC/21580/2012-2013

CERTIFICATION

This dissertation entitled “Exploring the perceptions of network managers on bandwidth and online video streams in Ahmadu Bello University, Zaria” meets the requirement for the award of Master Degree in Information Science, from the Department of Library and Information Science of Ahmadu Bello University, and is approved for its contribution to knowledge and Literacy**.**

……. ----------

Dr. Ezra S. Gbaje Date
Supervisory committee

……. ----------

Dr. I. Yazid Date
Supervisory committee

……. ----------

Dr. Baba Aduku Date
Head, Department of Lib. and Info. Science

……. ----------

Prof. K. Bala Date
Dean School of Postgraduate studies

DEDICATION

This research work is dedicated to God Almighty for granting me the grace, favour, inspiration, strength, knowledge and understanding to be able to complete this research. To the memory of Late Dr L. I. Odigie and Ms. Cecelia Odigie.

ACKNOWLEDGEMENTS

All praise is due to Almighty God for granting me the grace, favour, courage, strength, knowledge and understanding to carry out this research work successfully. I am greatly indebted to my supervisor's Dr Ezra Gbaje and Dr Ibrahim Yazid for their incredible supervision, guidance, patience, advice, understanding and above all moral support.

I also wish to express my sincere gratitude to all staff of the Department and Faculty for their great contributions, wonderful counselling and suggestions towards the success of this work. I also wish acknowledge the PG Coordinator and staff of ICICT for their support and encouragement.

Furthermore, words cannot express my appreciation to my friends and colleagues especially Kenneth, Lois, Okeoma, Peace, Godwin aka Ubuntu, Imam, Amina and others whose names are not mentioned for their support and contributions throughout the course of my study. I wish to appreciate the efforts of senior colleagues as well; Mallam Hayatu, Mrs Justina and Others whom are not mentioned.

Finally, my sincere gratitude goes to all my family members who have contributed directly to the success of my research work.

TABLE OF CONTENT

LIST OF ACRONYMS

ABU: Ahmadu Bello University

AVU: Africa Virtual University

OAU: Obafemi Awolowo University

UJ: University of Jos

BUK: Bayero University Kano

UI: University of Ibadan

USDE: United States Department of Education

MbPS: Megabits Per Second

KbPS: Kilobits Per Second

MBPS: Megabytes Per Second

KBPS: Kilobytes Per Second

SD: Standard Definition

NGT: Network Gatekeeping Theory

AUP: Acceptable User Policy

R&D: Research and Development

TKIG: Techknow-Logical Knowledge Gatekeepers

RT: Retweet Networks

FF: Followers and Followees

NIS: Network Infrastructure and Security Services Unit

ICICT: Information Computing and Information and Communications Technology

CFOT: Certified Fibre Optic Technician

CCNA: Cisco Certified Network Associate

CCNP: Cisco Certified Network Professional

RHCE: Redhat Certified Engineer

MTCNA: Mikrotik Certified Network Associate

CEH: Certified Ethical Hacker

QoS: Quality of Service

IP: Internet Protocol

HTTP: Hypertext Transfer (Or Transport) Protocol

OPERATIONAL DEFINITION OF TERMS

Network gatekeeper: A person or persons in charge of the information network and manages the functioning of said network used interchangeably with network managers and network administrators

Gatekeeping mechanism: A tool which aids the network gatekeeper in his functions example routers, servers and switches.

ABSTRACT

Online video streaming is a learning technology used in today's world and reliant on the availability of bandwidth. This research study sought to understand the perceptions of network managers about bandwidth and online video streams in ABU Zaria. To achieve this, the interpretive paradigm and the Network Gatekeeping theory were used as the theoretical framework and also a case study approach was employed to investigate the phenomena. The study used a purposive sampling technique and a semi-structured interview to seek out opinions from the respondents. A thematic analytical approach was done with the use of Nvivo software, which yielded one hundred and seven codes, ten sub-categories and four major categories. The findings from the study indicated that 1) perceptions of network managers was one sided 2) no acceptable user policy was on ground and available bandwidth was limited 3) limitation of bandwidth, hindered user access to online video and mechanisms for gatekeeping had a role to play in the overall access to online video. Findings interpreted using the network gatekeeping theory suggest that to facilitate access for online video streaming user claims and bandwidth be taken into consideration.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Education today has diversified from the traditional classroom experience to learning through online video streaming which is the simultaneous download and play of video from an online video database (Hartsell, T., & Yuen, S. 2006; Siemens, G., & Tittenberger, P. 2009). The use of these online videos requires the availability of networks and its resource "bandwidth". Bandwidth is the total data carrying capacity of the channels in a network and one of the requirements to play online videos is having sufficient bandwidth, (Oswald, 2014). Online video streaming over networks (wired or wireless), often suffers from bandwidth limitations and outages, which leads to loss of frame. These frame losses have a significant effect on the time it takes to stream or download thereby affecting the user-perceived emotions and learning ability. In order to facilitate access to online video streaming, it is imperative that user claims and bandwidth be given salience.

Various researchers (Yang & Veciana, 2001; Abendroth & Kilat, 2005; Adewale, 2009) have conducted studies to find a lasting solution to bandwidth limitation and outages, but the problem still persists. To address the problem, there is need to explore how bandwidth is managed specifically the influence of actions by network managers and networking infrastructure on users of online video. Managing bandwidth will curtail wastage of network resources since bandwidth will be allocated based on usage patterns. With proper bandwidth management users of a network, can stream online videos, which will consequently lead to better experiences and the use of online video in learning.

1.1.1 History and Development of Ahmadu Bello University Network

The Ahmadu Bello University was established in October, 1962 and founded by Sir Ahmadu Bello who was the premier of Northern Nigeria as well as its first Vice Chancellor. The university is located in Zaria, Kaduna State. Operates two campuses, with twelve faculties and a post graduate school with a student population totalling over thirty-eight thousand. As at 2005, the management of Ahmadu Bello University (ABU), entered into a bandwidth consortium agreement under the auspices of the Africa Virtual University (AVU) with five other universities in Nigeria namely; Obafemi Awolowo University (OAU) Ife, University of Jos (UJ), University of Port Harcourt, Bayero University Kano (BUK) and University of Ibadan (UI) to acquire a 6.5Mbps of bandwidth to improve on the 512kbps it had before the formation of the consortium (Adedokun, 2009). Observing the growing need for internet connection and bandwidth they made a conscious effort to improve the internet facilities within the school premises by deploying a Cisco-fibre optic network infrastructure that will enable the delivery of high-speed Internet and intranet access to students and staff alike as well as facilitate and enhance e-learning, online applications and multimedia communication services for all campus residents (The Network, 2011).

1.1.2 Online video technology and learning patterns

Since the inception and use of online video in education, learning and learning process of students has changed dramatically. Dede (2005), states that "Rapid advances in information technology (online video), are reshaping the learning styles of many students in higher education." Whether it be self-directed learning, collaborative learning or active learning it is undeniable that technologies like online video have greatly impacted learning

(Brown, J. S. 2006; Barron, B., & Darling-Hammond, L. 2008). Learning can be defined as the cognitive process of acquiring skills or knowledge. Driscoll (2000), defines learning as "a persisting change in human performance or performance potential which must come about as a result of the learner's interaction with the world. Atkinson, R.L., Atkinson, R.C., Smith, E.E., and Bem D. J. (1993), described learning as "a relatively permanent change in behaviour that results from practice." Multimedia applications like online videos tend to generate more frequent teacher-student interactions, and student-student interactions as well more student involvement in e-Learning activities (Kurtz and Sponder, 2010).

1.1.3 Significance of Online Video to the Learner

The late 1990's found educators seeking new and innovative ways to pass across knowledge and ideas effectively and efficiently through instructional media and teaching aids like graphs, maps and videos. However, as a resultant effect of the advent of the internet, none has caught more attention than online video streams (McKinsey & Company. 2011; Pisharody, A. 2013). Klass (2003), highlighted that streaming media such as video and audio can help learners understand complex concepts and procedures that are difficult to explain with simple text and graphic. In support of this assertion, Hartsell and Yeun (2006), expressed a similar view that "online video plays a dramatic role in delivering course materials to students as it brings the course alive by allowing student to use their visual and auditory senses to learn complex concepts and difficult procedures". Khan (2011) highlighted other merits of online video being in the learner's control, he stated that the learner or viewer becomes active in the online video learning environment, with the ability to pause, stop, skip, and/or rewind sections to review problematic content until understanding is achieved.

Online video also allows students the capacity to choose what to watch, when to watch, and where to watch. The Joint Information Systems Committee (2002), opined some of the importance of online videos to students; "students can access the material (online video) asynchronously and independent of their location. Students are no longer bounded by the traditional classroom environment or the library to view these visual materials provided by an instructor. Other control element is the choice over which material to observe on-demand in other words the choice of what to watch.

Fujimoto (2014), further validates some of the uses of online videos to learners;

- Serves as a motivation tool to learners: Video is visually and auditory stimulating, and watching video can be an engaging experience for people of all ages.

Choi and Johnson (2005) support this assertion by stating that "Using video for instruction improves the attention span of learners for video-based instruction as opposed to text-based instruction. Promotes active learning; video has been found to enhance effective learning because it allows for participation whilst viewing. Kamin, O'Sullivan, Deterding, and Younger (2003) found out that;

a. Students who learned using digital video engaged in more critical thinking than those who did not.
b. Video stimulated cognitive processes that helped facilitate active learning.

- Use to enhance cognition: the use of online video can help improve the students' own thoughts on a particular subject matter.

Video can also generate metacognition by presenting concrete examples that allow viewers to reflect on their own understanding of concepts or procedures, video also promotes

metacognitive thinking by allowing viewers to compare themselves to experts or peers performing tasks in the video (Choi & Johnson., 2007; Wouters., Tabbers., & Paas., 2007; Homer., Plass., & Blake., 2008). Some scholars (Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. 2010) summed up an evaluation of evidence based practices in online learning for the united states department of education which showed that students given the privilege for online video conditions performed moderately better, on average than those learning the same thing with just traditional face-to-face instruction. This benefits highlight upon the gravity of the problem of having access to online video which is underpinned by bandwidth.

1.1.4 Bandwidth and Bandwidth Management

Bandwidth is a term which refers to the data transmission rate or the maximum amount of information that can be transmitted along a channel. The band part of the word bandwidth comes from “broadband” (Maru, H. W. 2011). Which means a large range of frequencies that are available to transmit information. Bandwidth is commonly referred to as the capacity or data transfer rate of a particular communication channel (Wikipedia. 2010; TechTarget. 2015). Sharma., Thakur., & Vikram (2011), opined that bandwidth is responsible for data transfer speeds, therefore the bigger the bandwidth quota, the quicker the connection speed. These bandwidth speeds however great, if not managed right would still be inadequate. The management activities conducted on any bandwidth is referred to or known as bandwidth management.

Bandwidth management is a set of activities which are undertaken by organization whom have obtained bandwidth, to ensure the efficacy and control of their communication lines. Flickenger., Belcher., Canessa., & Zennaro (2006), stated that for a network

connection of any size to continuously remain optimal, organizations must take a multifaceted approach that includes effective monitoring and analysis, a policy that defines acceptable behaviour and a solid implementation that enforces these rules. Lockias (2012), referred to the term as a generic term that describes the various techniques, technologies, tools and policies employed by an organization to enable the most efficient use of its bandwidth resources. All these activities are all aimed at improving the overall performance of any communication line and avoidance of an overload.

1.2 Statement of problem

The world today, is filled with lots of educational online video content, streamed and downloaded across the web (Means, B., et al 2010). These information resources can only be accessed over reliable networks. Scholars having recognized the importance of online video to students, emphasize its ability to enable better understanding of complex concepts, bring the classroom to life, enable learner control and improve the learning process as students see complex actions and procedures in play (Michelich., 2002; Klass., 2005; Hartsell and Yeun., 2006). The new saying of "videos being worth a million pictures", therefore holds true in this case as moving images combined with sound on the web (online video), engages the learner and helps enhance the learning process. Deneen (2002), asserts that a robust campus network is a necessity in university campuses for a proper appreciation of the role internet plays in learning. Students everywhere in the world can access and use these online videos provided the internet bandwidth exists. The same is true of the students in the Ahmadu Bello University (the university), they utilize this resource to enhance their skills and improve upon their classroom experience.

However, despite all the accrued benefits online video plays in institutions of higher learning, users of the university network still find it difficult accessing these online videos. Preliminary observations of the university's network undertaken by the researcher, showed that network managers in the university limit the bandwidth of their users. Since most online videos transmissions are time sensitive, transmitting of packets in a bandwidth limited network would incur a sender-to-receiver delay of more than a few hundred milliseconds (Cisco, 2014). Transmitting late packets whose timing constraints are violated wastes bandwidth because late arrivals carry useless information, at best, they are useful for concealing errors in subsequent frames. In a bandwidth-limited environment, sending late packets can delay the transmissions of subsequent valid packets and potentially create more late arrivals. Meeting timing constraints of video data in bandwidth limited networks is especially challenging as the exhibit unpredictable delay and loss rates (Ibrahim, Jamal, Yahya, & Taib, 2012; Kim, 2014). According to Cisco (2013), one of the most common network problems is insufficient or unreliable bandwidth. Bandwidth limitations can cause packet loss, delays and jitters. This high bandwidth demand makes video streaming over networks with limited and constrained bandwidth a challenging problem.

Could the actions by network managers (bandwidth limit and mechanisms) explain the reasons for the slow buffer speeds associated with online video play and download? To address this problem, the network gatekeeping theory which discusses the importance and power play between the user (gated) and the network managers (network gatekeeper) will be used as a framework. The theory posits two ideologies the first which identifies the key stakeholders in the network environment and the second which discusses the changing

stance and importance of these stakeholders to one another within the network environment.

1.3 Research Questions

This research is aimed at answering the following research questions

1. How do network gatekeepers perceive their gatekeeping role on ABU network?
2. What factors do bandwidth network gatekeepers consider in the limitation of bandwidth?
3. How does information control and gatekeeping mechanisms influence access to online video content?
4. How does the network gatekeeping theory explain the perceptions of network managers on bandwidth and online video access?

1.4 Objectives of the Study

The study has the following objectives itemized below;

- To identify the various perceptions of the network gatekeepers towards their gatekeeping role on ABU network.
- To ascertain the factors bandwidth gatekeepers of the university, consider in the limitation of bandwidth.
- To ascertain how information control and gatekeeping mechanisms influence access to online video.
- To explore how the network gatekeeping theory explains the perceptions of network managers on bandwidth and access to online video.

1.5 Assumptions of the study

This work is based on the following assumptions;

1. That there is adequate bandwidth
2. Bandwidth management is being undertaken.
3. That the quality of experience for the user is taken into considerations in the course of bandwidth management.

1.6 Scope and Delimitation

The study has limited its scope to the bandwidth management in Ahmadu Bello University and all institutes where this bandwidth covers.

1.7 Significance of the Study

The research work will serve as a pioneer study upon which further works in the area will be carried out. The study will be also useful to the university management and students in the sense that its findings will lead to better understanding of the views of bandwidth managers and a change in the management patterns of the bandwidth. Hence better quality of service will be achieved for the users of the network infrastructure. Upon review of various scholarly work in the field of information science and library science it was observed that very few studies reported in the area of bandwidth and its management as against others on automation, cloud computing and application of social networks and their devices to the library routine. Bandwidth however is a valuable resource and its management relates closely to access to information and should be viewed as such by libraries and information professionals alike, because it is responsible for the transfer

speeds at which we access and receive information across and within the internet. As a result of this, the work hopes to lead information professional on a path to better appreciation and understanding of bandwidth.

References

Abendroth, D., & Killat, U. (2005). Effective bandwidth shaping: a framework for resource dimensioning extended version. Computer Communications, 1-8. Retrieved February 18, 2015, from http://www.sciencedirect.com/science/article/pii/S0140366404004074

Adedokun, A. (2009). Bandwidth Management Using IP Traffic Analysis: Electrical Engineering. Ahmadu Bello University.

Atkinson, R.L., Atkinson, R.C., Smith, E.E., & Bem D J., (1993), Introduction to Psychology. Harcourt Brace Jovanovich, Fort Worth, TX, 11th edition.

Barron, B., & Darling-Hammond, L. (2008). Teaching for meaningful learning: A review of research on inquiry-based and cooperative learning. *Powerful Learning: What We Know about Teaching* ., 11–70. Retrieved from http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Teaching+for+meaningful+learning:+A+review+of+research+on+inquiry-based+and+cooperative+learning#0

Brown, J. S. (2006). 21st Century Learning Environments. *Partnership for 21st Century Skills*, 1–29. http://doi.org/10.1787/9789264006508-en

Choi, H. J., & Johnson, S. D. (2005). The effect of context-based video instruction on learning and motivation in online courses. The American Journal of Distance Education, 19(4), 215-227.

Choi, H. J., & Johnson, S. D. (2007). The effect of problem-based video instruction on learner satisfaction, comprehension and retention in college courses. British Journal of Educational Technology, 38(5), 885-895.

Cisco. (2014). Cisco Corp. Retrieved August 14, 2014, from Visual Networking Index: http://www.cisco.com/c/en/us/solutions/service-provider/visual-networking-index-vni/index.html

Cisco. (2013). Cisco WebEx network bandwidth. Retrieved from Web Conferencing and OnlineMeeting:http://www.cisco.com/c/en/us/products/collateral/conferencing/webex-meeting-center/white_paper_c11-691351.pdf

Copyright Clearance Center. (2009). Video Use and Higher Education:Options for the Future. New York.

Dede, C. (2005). Planning for Neomillennial Learning Styles. Educause Quarterly, 1, 7-12.

Deneen, L. (2002). Bandwidth Managenment Tools,Strategies, and Issues. Minnesota Duluth: University of Minnesota.

Driscoll, M. P. (2000). Psychology of learning for instruction (2nd ed.). Needham Heights,MA: Allyn & Bacon.

Flickenger, R., Belcher, M., Canessa, E., & Zennaro, M. (Eds.). (2006). *How to Accelerate Your Internet.* Internet Network for the Availability of Scientific Publications, International Centre for Theoretical Physics

Fujimoto, R. (2014). Using Video in an Interactive Learning Program. Retrieved from Shoyu Learning Solutions: http://www.shoyu.com/research_using_video_interactive_learning_pro grams.asp

Hartsell, T., & Yuen, S. (2006). Video streaming in online learning. *AACE Journal*, *14*(1), 31-43. Retrieved from EdITLib Digital Library. (6152)

Homer, B., Plass, J., & Blake, L. (2008). The effects of video on cognitive load and social presence in multimedia-learning. Computers in Human Behavior, 24(3), 786-797.

Ibrahim, M. F., Jamal, M., Yahya, S., & Taib, M. N. (2012). Available bandwidth estimation in network-aware applications for wireless campus e-learning system. *Journal of Computer Networks and Communications*, *2012*. http://doi.org/10.1155/2012/380959

Joint Information Systems Committee. (2002). Video streaming: A guide for educational development. Manchester, UK: JISC Click and Go Video Project.

Kamin, C., O'Sullivan, P., Deterding, R., & Younger, M. (2003). A comparison of critical thinking in groups of third-year medical students in text, video, and virtual PBL case modalities. Academic Medicine, 78(2), 204-211.

Karanja, G. (2006). African Tertiary Institutions Connectivity Survey. International Development Research Centre.

Kim, S. (2014). Learning based bandwidth management algorithms by using bargaining and fictitious play approaches. Computer Networks, *73*, 15–21. http://doi.org/10.1016/j.comnet.2014.08.001

Klass, B. (2003). Streaming media in higher education: Possibilities and pitfalls. Syllabus, 16(11).Retrieved September 4, 2014 from http://www.syllabus.com/article.asp?id =7769

Klass, B. (2005). Streaming media in higher education: Possibilities and pitfalls. Campus Technology (in print). Retrieved October 21, 2014, from http://www.campus-technology.com

Kurtz, G., & Sponder, B. (2010). SoTL in Online Education : Strategies and Practices for Using New Media for Teaching and Learning Online SoTL in Online Education : Strategies and Practices for Using New Media, *4*(1).

Lockias, C. (2012). Bandwidth management in universities in Zimbabwe: Towards a responsible user base through effective policy Implementation. *International Journal of Education and Development using Information and Communication Technology*, *8*(2), 62-76.

Maru, H. W. (2011). *Addis Ababa University Faculty of Informatics Department of Information Science Developing Dynamic Bandwidth Allocation Prototype Model for Campus Network Faculty of Informatics Department of Information Science*.

McKinsey & Company. (2011). The impact of Internet technologies: Search, (July), 58. Retrieved from http://www.mckinsey.com/insights/marketing_sales/measuring_the_value_of_search

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. *U.S. Department of of Education*, 94. http://doi.org/10.1016/j.chb.2005.10.002

Michelich, V. (2002). Streaming media to enhance teaching and improve learning. The Technology Source. Retrieved December 4, 2013 from http: //ts.mivu .org/default. asp?show= article&id=941

Oswald, E. (2014). Hearst Newspapers, LLC. Retrieved from Small business: http://smallbusiness.chron.com/advantages-disadvantages-streaming-video-67979.html

Pisharody, A. (2013). The Future of Television: Will broadcast and cable television networks survive the emergence of online streaming? *NYU Stern*, (May), 55.

Sharma, V., Thakur, B. S., & Vikram, K. (2011). Need of Bandwidth Management and Formulation of Policy Framework for Effective Utilisation of Internet Services Within a University Campus. *International Journal of Computer Science and Communication, 2*.

Siemens, G., & Tittenberger, P. (2009). Handbook of Emerging Technologies for Learning. Image Rochester NY, 65. Retrieved from http://umanitoba.ca/learning_technologies/cetl/ HETL.pdf

TechTarget. (2015). What is bandwidth - Definition from WhatIs.pdf. Retrieved February 6, 2016, from http://searchenterprisewan.techtarget.com/definition/bandwidth

The Network. (2011). Ahmadu Bello University Chooses a Cisco Borderless Network Architecture to Create the Most Sophisticated Campus Network in Nigeria Retrieved December 15, 2015, from http://newsroom.cisco.com/press-release-content?articleId=571264

Wikipedia. (2010). Simple English Wikipedia, The Free Encyclopedia. Retrieved February 6, 2016, from https://simple.wikipedia.org/wiki/Bandwidth

Wouters, P., Tabbers, H. K., & Paas, F. (2007). Interactivity in video-based models. Educational Psychology Review, 19(3), 327-342.

Yang, S. Y. S., & Veciana, G. De. (2001). Bandwidth sharing: the role of user impatience. *GLOBECOM'01. IEEE Global Telecommunications Conference (Cat. No.01CH37270)*, *4*. http://doi.org/10.1109/GLOCOM.2001.966181

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter of this research study consists of review of related literature under the following sub-headings:

- Research Paradigm
- Gatekeeping
- Theoretical Framework (network gatekeeping theory)
- Basic principles of Network gatekeeping theory
    - The gate principle
    - The gated principle
    - The network gatekeeper principle
    - The gatekeeping principle
    - The gatekeeping mechanism principle
- Previous studies
- Bandwidth Management, and Bandwidth Limiting Impact on Video Packets
- Uniqueness of the study
- Contribution and implications for further studies
- Summary of the Review

2.2 Research Paradigm

Researchers have different beliefs and ways of viewing and interacting within their surroundings. As a result, the ways in which research studies are conducted vary. However,

there are certain standards and rules that guide a researcher's actions and beliefs. These standards or principles can be referred to as a "paradigm". The term paradigm owes its origins to the Greek word "*paradeiknunai"* which means to show side by side. Kuhn (1962) defines a paradigm as: "an integrated cluster of substantive concepts, variables and problems attached with corresponding methodological approaches and tools". Furthermore, paradigm refers to a research culture with a set of beliefs, values, and assumptions that a community of researchers have in common regarding the nature and conduct of research (Kuhn, 1977., Case, 2007). A paradigm hence implies a pattern, structure and framework or system of scientific and academic ideas, values and assumptions (Olsen, Lodwick, and Dunlop, 1992). The importance of a paradigm in research is to enable a particular sense to be made of the analysis and the finding. For this research, the researcher intents to adopt the interpretive paradigm. Hence, the interpretive paradigm is the assumptions and beliefs that inform this study.

Interpretive paradigm is underpinned by observation and interpretation, thus to observe is to collect information about events, while to interpret is to make meaning of that information by drawing inferences or by judging the match between the information and some abstract pattern (Aikenhead, 1997). It attempts to understand phenomena through the meanings that people assign to them (Deetz, 1996). According to Reeves & Hedberg (2003) the "interpretivist" paradigm stresses the need to put analysis in context and is concerned with understanding the world as it is from subjective experiences of individuals. They use meaning (versus measurement) oriented methodologies, such as interviewing or participant observation, that rely on a subjective relationship between the researcher and subjects.

Interpretive research does not predefine dependent and independent variables, but focuses on the full complexity of human sense making of the situation.

2.3 Gatekeeping

Traditionally, gatekeeping is viewed as a one-way, top-down selection process, in which gatekeepers are the main actors. It ignores the impact on those whom gatekeeping is exercised, viewing them as passive (Barzilai-Nahon, 2008). The gatekeeping theory owes its roots to the efforts of Lewin (1947), whom first coined the concept of the gatekeeper in his work "channels and gatekeepers" as a means of understanding how mothers decide what foods make their way to the table from a vast community of foods available. Gatekeeping is the process by which billions of messages that are available get cut down and transformed to hundreds of messages before they reach a given person on a given day (Shoemaker 1991). Shoemaker's gatekeeping serves as a selective decision making process of messages that either pass or are cut down. Lewin (1951), explained in his experiments on individuals in groups argued that group decisions depend on aspects of communal steering through gatekeepers. He described entry to a channel as a gate, movement within and between the channels is controlled by one or more gatekeepers or impartial rules. According to Bantz (1990), adopting a group consensus by daily professional interaction has direct impact on gatekeeping hence the development of the network gatekeeping theory.

2.4 Network Gatekeeping Theory (NGT)

Network gatekeeping on the other hand has a much greater emphasis on the 'gated', or ''the entity subjected to gatekeeping'' (Barzilai-Nahon, 2008), and the power

relationships between the gatekeeper and the gated; that is, the power in relation to the gatekeeper, information production ability, the relationship and interactions between the gatekeeper and the person subjected to gatekeeping, and the available practical alternatives to decide on other courses of action. Network gatekeeping is a dynamic, discretionary process of information control where the gatekeeping role can be modified depending on the stakeholders and context of the interaction. As communities of networks and more specifically the internet have become more popular the role of the gatekeeper and the process of gatekeeping has changed from traditional methods used in media and journalism. Donhue, Tichenor & Olien (1972) provide a much broader definition of gatekeeping as a process of information control that includes all aspects of information processing, not just selection but also withholding, transmission, shaping or manipulation, display, repetition, and timing of information as it flows from sender to receiver. The uni-direction of the definitions and disregard of the gated led to the development of the network gatekeeping theory (NGT).

The theory explains the information control of gatekeepers as a function of the power they possess over their gated in an information network and the salience of the gateds' claims to the network gatekeeper. Case (2007), identified salience as items that stand out, vivid, deviant and unexpected. As against the old norms of gatekeeping which was similar to a sender- receiver transmission or a one-way flow of information the network gatekeeping theory looks at the gated being a figure that has importance and plays a role in the information network.

In network gatekeeping, a gate is an entrance to or exit from a network or its sections, and the gatekeeping process is a dialogical one that has forms and meanings

shaped by both gatekeeper and gated. Hoskins & O'Loughlin (2011), questioned whether gatekeeping could appropriately be applied to a network context but found that diffused, collaborative gatekeeping does indeed arise from communicative networks. The concept of network gatekeeping therefore is important for several reasons: First, it presents a model that is applicable beyond the relatively narrow editorial gatekeeping concept of journalism and mass communication research.

Second, it acknowledges the significance of those on whom gatekeeping is being exercised, recognizing that it is not necessarily enacted by force and could be built upon through continually negotiated relationship. Third, it is structured to incorporate the distinct nature of power in a networked context, which is highly asymmetrical but produces more fluid shifts in power than in traditional models (Castells, 2011; Nahon, 2011). Fourth, it begins to consider the implications of a networked society on gatekeeping processes, accounting for the connectedness, fluidity, and collaborative potential of both gatekeepers and the gated. This concept of network gatekeeping has only begun to be tested and applied to cases within a networked digitally mediated environment (Hoskins & O'Loughlin, 2011; Meraz & Papacharissi, 2013).

NGT offers new definitions of the role of the traditional gatekeepers and gatekeeping by adapting traditional concepts to a networked society. The network gatekeeping theory views the gatekeeping process as the control of information as it moves through gates (Barzilai-Nahon., 2008).

2.4.1 Basic Principles of Network gatekeeping theory

Barzilai-Nahon (2004), built her network gatekeeping theory based on two ideologies one that firstly identifies five principles or concepts; the concept of the gate, the concept of the gated, the concept of the network gatekeeper, the concept of the gatekeeping mechanism and the concept of gatekeeping. Then the other that discusses the salient roles of the gated to the network gatekeeper along these four axis; (the power, information production, relationship and alternatives):

The gate principle

The network gatekeeping theory identifies the gate as a passage or entrance to or exit from a network or its sections. The concept explains that the gate holds or blocks out intruders from restricted areas within the network. It is important to note that the actuality of a clear gate (conceptual or physical) in network gatekeeping is almost impossible due to the dynamism of information networks and information technologies. In some cases, the gate can be seen as an authentication control or gateway where a login is required for a user to enter into or exit from such a network. The ideology of authentication controls comes from Zviran and Haga (1993) which discuses "what the user knows," "what the user has," and "who the user is" However due to the dynamism of the information networks, the principle of the gate is of less importance than the rest of the networking gatekeeping concepts.

The gated principle

The gated is an entity or being subjected to the gatekeeping process. The gated is bounded by gatekeeping sometimes from his or her own free will since he or she may have

alternatives. Network gatekeeping suggest the gated playing a crucial role in the gatekeeping process, this role is explored in the salient component of the theory which takes into account interactions between gated and gatekeeper. It is important to note that the gated are basically users within the network gatekeeper's information network and that these users are viewed along their claims and power or social capital Barzilai-Nahon (2004).

The network gatekeeper principle

The network gatekeeper is defined as the entity (people, organizations or government) that has the discretion to exercise gatekeeping through a gatekeeping mechanism in networks and can choose the extent to which to exercise it contingent upon the gated standing. Barzilai-Nahon (2007), suggests a classification of network gatekeepers from two dimensions. First is an authority dimension that sees the gatekeeper through the authority scope they have from the micro to macro levels of authority. Secondly is the functional dimension which reflects gatekeepers' roles, formal and professional designations and positions in the context of the gatekeeping exercise.

The gatekeeping principle

The gatekeeping concept is defined as the processes involved in controlling information as it moves through a gate. It includes such activities as channelling, shaping, manipulation, localization, disregard, deletion and denial of information access. The identification of gatekeeping processes is similar to one proposed by Donohue et al. (1972), which looks at information control between gatekeeper and gated as uni-directional and dictated by gatekeepers. Without seeing the importance of the gated needs to the gatekeeper

in carrying out the gatekeeping tasks. Goode (2011), opined a possibility of external interests influencing the gatekeeping process and hence shaping and improving the information produced in news networks.

The gatekeeping mechanism principle

The gatekeeping mechanism is looked at as a tool, technology or methodology used to execute the process of gatekeeping. The mechanism carrying out the control of information or in this case bandwidth also dictates and mediates the interactions between gatekeepers and gated. Barzilai-Nahon (2004), confirmed that inequality in the access to the internet can serve as a gatekeeping mechanism for elites by discouraging entry of the less privileged into the network. Some of the functions of the gatekeeping mechanism include: channelling, traffic shaping, bandwidth throttling, allocation, deletion of users and security. Barzilai-Nahon (2007), itemized the following as some of the gatekeeping mechanisms in a network context;

1. Channelling Mechanisms: Channelling mechanisms such as search engines and hyperlinks, are gateway stations designed to attract attention of gated (users) and convey or direct them into or through their channels. Other forms of channelling mechanisms with the network environment are routers and switches which are directly involved in choosing the best path through which packets travel.
2. Censorship Mechanisms: Censorship mechanisms are a set of means aiming towards suppressing or deleting anything considered objectionable or undesired. That is assuring that ‘undesired’ information does not enter or exit

or circulates the gatekeeper network. For example, blocking users from entering into a corporation email system, blocking the use of the darknet (tor), blocking file sharing sites and software use. Censorship mechanism could also be applications and devices used in controlling the actions of the gated within the network.

3. Internationalization Mechanism: These mechanisms cover methodologies of localizing information, services and products, according to characteristics of communities based for example on customs, cultures, nationalities, languages and religions. Internationalization mechanism are the techniques used in the domestication of information.
4. Security Mechanism: Security mechanisms try to manage confidentiality, availability and integrity of information flow in the gatekeeper's network.
5. Cost effect Mechanism: Mechanisms that control the cost of gated to join, use and exit a gatekeeper's network. The cost of joining a network refers among other things to the cost of infrastructure, connecting to infrastructure and maintaining it as controlled by the gatekeeper. Following the above explanation given for the cost effect mechanism, the cost effect mechanism, in networks could also be referred to as load balancing techniques or mechanisms.

The second part "salience" picks out the gated and the network gatekeeper and emphasizes on the role the gated can play in an information network, along four themes or constructs. These are their power in relation to the network gatekeeper, their relationship with the network gatekeeper, their information production ability and lastly alternatives in the context of gatekeeping (Barzilai-Nahon 2004).

The power of the gated in relation to the network gatekeeper

In discussing the power of the gated in relation to the network gatekeeper, Barzilai-Nahon (2007), picked on a definition of power given by the Weberian school (1946), as the ability to get others to do what you want them to do, even if it is against their will. This concept was later carried on by Dahl (1957), who defined power as "A has power over B to the extent that he can get B to do something that B would not otherwise do.

The relationship with the network gatekeeper

In discussing this relationship, Barzilai-Nahon highlighted the seven metaphors for communication given by Putman (2000), which are conduit, lens, linkage, performance, symbol, voice, discourse and picked out linkage stating that it projects on the direct connection between the gated and the gatekeeper and emphasizing the enduring relational facet. The existence of a direct connection and its endurance play a major role by creating a venue for negotiation of stances between the gated and the gatekeeper.

Their information production ability

Barzilai-Nahon (2004) clarifies that Information production is merely a prerequisite for information transfer. This means that in order for there to be information transferred it must first have been produced. This statement, however does not stress much importance as to who produces the information. She states that other researches seems to predispose scholars to adopt a one-sided perspective, that of the gatekeeper. This silencing any inclination to raise in-depth questions about the nature of gated information production.

The alternatives in the context of gatekeeping discusses the opportunity for deciding between two or more options.

2.4.2 Previous Studies that used the Network Gatekeeping theory

Gao, H., Knight, G. J., Yang, Z., & Ballantyne, D., (2014), in their work entitled; Towards a gatekeeping perspective of insider-outsider relationship development in China. The study explores how relational gatekeepers facilitate the development of relationships between out-group members and in-group members in an intercultural business environment, and to bring to the surface the inter-cultural and inter-networked nuances of guanxi. Based on 33 interviews with managers from China and New Zealand, the workings of Chinese–Western business relationships and the roles of relational gatekeepers are explored. Empirical findings reveal three key gatekeeping roles, namely reciprocal, adaptive and symbolic, used for enabling the development of intercultural business relationships.

Coddington, M., & Holton, E.A., (2013), in their study entitled When the Gates Swing Open: Examining Network Gatekeeping in a Social Media Setting. The study examines the way in which organizations have adapted the process of gatekeeping to respond to the collaborative, communicative power of users upon which they are exercising their gatekeeping authority. The researchers formulated the following research questions to guide their research: 1) in what ways are the Cleveland Indians subverting or reshaping the traditional gatekeeping role through the social suite? 2) What role are the social suite's users playing in the gatekeeping process, and how are they responding to the Indians gatekeeping actions? To answer this questions which require responses from the gatekeepers and gated as well, the researcher selected multiple methods from a triangulated qualitative approach. These approach constituted of three day trips to Cleveland in July and August 2011 to conduct participant observation, and in depth interviews with key

informants at the social suite. The findings from the study are as follows: 1) the results showed that the team exercised its gatekeeping authority most clearly in determining who would gain access to the suite as participants were selected through one of two primary processes, both of which allowed the team to shape the suite's makeup. 2) The results also showed that several users spoke sarcastically of being judged not good enough to be in the suite, and others concluded that they had been given access because they had a broad social media network or because they often spoke positively online about Cleveland. 3) Lastly the results showed that the team used the gatekeeping process to put together groups with similar interests and foster more social cohesion in the suite and thus more positive messages about their experiences in the suite.

A study by Meraz, S., & Papacharissi, Z., (2013), on networked gatekeeping and networked framing on #Egypt. The study describes, maps and explains evolving patterns of communication on twitter using the events on the Egyptian uprising which led to the resignation of President Mubarak. The researcher explores how elites and non-elites redefine the operation of gatekeeping and framing theories within networked crowdsourced environments. The research had the following questions: 1) who were the prominent users of the #Egypt and how was their prominence negotiated across different conversational markers? 2) To what extent did prominent users forge connections to other prominent users based on twitters different adversity markers? Using a multi-methodological approach, the researchers conducted a network, content, and discourse analysis of randomly sampled tweets from approximately one million tweets over a month-long time period to study broadcasting and listening practices on Twitter. The findings underscored a significant role of ordinary users who both rose to prominence and elevated others to elite status through

networked gatekeeping actions. 2) The findings also suggested networked framing and gatekeeping practices that became activated as prominent actors and frames were crowdsourced to prominence. 3) Discourse analysis of prominent actors and frames highlighted the fluid, repetitive processes inherent in networked framing as frames were persistently revised, rearticulated, and re-dispersed by both crowd and elite. These findings point to new directions for hybrid and fluid journalisms that rely on subjective pluralism, co-creation, and collaborative curation.

Deogratias, H., (2012), in a study entitled The Gatekeeper and the knowledge environment-who they are, how they work Empirical evidences from High-tech Manufacturing and R&D Firms. The study critically looks at the role of the Knowledge Gatekeeper within the manufacturing and high tech selected case studies by explaining who they are, how they work and identify and analyses the barriers to knowledge creation and knowledge sharing. Research instruments included a questionnaire and interviews from 105 and 40 respondents respectively. The research methodology used was guided by a deductive approach with a multiple case study strategy. The findings were as follows 1) Techknow-logical knowledge gatekeepers (TKIG) operate predominantly with the boundaries of informal networks and inclined to share information and knowledge with only a few experts within their network. 2) Key barriers to successful knowledge management are trust, the relational context and the identity between the source and recipient of knowledge.

Bastos T.M., Raimundo L.R., & Travitzki R., (2012), in a study entitled Gatekeeping Twitter: Message Diffusion in Political Hashtags. The study investigates the connection between twitter networks structures and message diffusion, by an analysis of

the relationship between retweet networks (RT), Mention Network (AT) and the Followers and Followees network (FF). Retweets being posts that twitter readers forward with full attribution to those who follow them, while the user's followers and followees network comprises a list of users who subscribe to one another's activity streams. 2) There is a close correlation between the tweet author's number of followers and the retweet rate. With the use of statistical analysis, results were gotten as follows: 1) The analysis showed that the growing number of retweets is not correlated to network properties such as a high number of followers and followees, but mostly to the assiduous activity of ordinary users who were not necessarily hubs or elite users themselves. 2) Retweet rates and the number of tweets per user is only the third statistically significant correlation in #Jan25, with the number of tweets per user in the dataset. The result concluded that gatekeeping emerges in digital networks in a form not necessarily dependent on network topology, and the results suggest an alternative scenario to the understanding of gatekeeping in mass media research.

A study conducted by Bui, C., (2010) entitled "how online gatekeepers guard our view -News portals' inclusion and ranking of Media and Events". This study looks at two news portals, google news and Yahoo news, with the notion of a search engine bias using the theoretical framework of Barzilai-Nahon (2007). The study tests one research question, about how prominent worldwide news agencies and major news media on result pages compared to other news media and three hypotheses. The hypothesis tested the relationship between the dominance of the news media, proximity of the news events to the U.S. interests, and the position of news links on portals. The study analysed 34,277 news items from 1200 pages retrieved over the course of 60 days in 2006 and 2008. The data showed four major trends: 1) Google news and yahoo news differed significantly in media inclusion

on their front pages with yahoo relying on a very limited number of media outlets. 2) The two portals also differed significantly in media in media inclusion on result pages except on the Iraq bombing of 2008. 3) Both news portals increased the proportions of major media and decreased that of non-major media between 2006 and 2008. 4) In both news portals, the distribution of media outlets was heavily skewed with very few media outlets used lots of times and the majority only a few. The hypothesis tests, using combined data of two portals over two years and separate data of each portal each year, show none of the three hypothesis are fully supported. These findings advance the understanding of the traditional gatekeeping notion on the internet. They also challenge the network gatekeeping theory on the role of the gated relative to the gatekeeper and caution against any generalization of news portals as single entities.

2.4.3 Bandwidth Management, and Bandwidth Limiting Impact on Video Packets

Bandwidth management is vital in an information network. It leads to the development of good policies and the integrity of an information network. Blue Coat (2009), viewed bandwidth management as essential stating that it allows for control and network flow in multimedia networks. Online videos being a relevant multimedia source in any learning environment is crucial and requires a little more bandwidth for its viewing than regular text (Kim & Varshney, 2005; Ying & Basu, 2005). As such, there is a need for plans and policies to be put in place in our information networks to cater for this. Kenny & Broughton, (2013) and Cisco, (2013), affirm the above statement that multimedia requires different amounts of bandwidth and as such, networks (network gatekeepers) should take this into account.

Bandwidth limiting is one of the tactics employed in bandwidth management, in which the transfer and receive rate of a user on the network is controlled. Jeffrey A. Hogan & Joseph D. Lakey (2012), refer to the term bandwidth limiting as restricting a signal such that its amplitudes are equal to zero against its finite frequency. The terms bandwidth limit and allocation can be used interchangeably as they all refer to reduction in the overall capacity of bandwidth available to a user. Abendroth & Killat (2005), explain that bandwidth limiting estimates the departing traffic flow against the upper traffic and intervenes. This intervention means a drastic cut down on the traffic generated leading to failure of data in reaching its destination and results in a jittery playback of online videos files. Abidin., Yusof., & Suliman., (2014), argued that low bandwidth limits result in the need for retransmission of packets, which lead to congestion of the communication line. Shalangwa (2014) stated, "Packets are less delivered in narrow bandwidth than wide bandwidth". Lots of institutions of higher learning and other academic environs experience bandwidth problems. Some of their experiences and how the tackled or managed the situations are highlighted below.

Lockias C., (2011), reported on the problem of bandwidth availability in universities in Zimbabwe. The study was aimed at finding out what these universities are doing to manage the available bandwidth. Upon researching it was discovered that these universities did not have an official acceptable use policy (AUP) for their networks, to assist the bandwidth management. The author recommended the adoption of a university wide AUP and awareness programs to change the internet behaviour patterns of its users. Another study by Sharma, V., Kumar, V., & Thakur, B. S. (2011), looked at the need for bandwidth management and formulation of a policy framework for effective utilisation of

internet services within the Himachal Pradesh University, Summer Hill, and Shimla university campuses. The recommended technical training, fierce enforcement of the internet policy and better monitoring of the available bandwidth as solutions to the problem. Lastly Ashley Wainwright (2015), looked at how to improve schools' wireless networks, the problem observed was a plethora of mobile wireless devices hitting schools' wireless networks and causing congestion and slow access to internet resources. The solution recommended was an adoption of a wide area network optimization thereby prioritizing the data flow for educational applications and online learning apps.

2.5 Uniqueness of the Study

This study uniqueness began by showing relationship between bandwidth and online video showing that online video does indeed rely on bandwidth for smooth playback and download. Various studies that made use of the network gatekeeping theory were reviewed and they connections between the studies and this work are;

- They all used the network gatekeeping theory
- They talk about the power struggle, information control and segmentation between gatekeepers and gated
- They examine the relationship build and communication patterns between the gated and gatekeeper

Some of the dissimilarities between the reviews and this work are; this research would deal on the network gatekeeper, explain his role and functions in a network environment which could aid or adversely affect the learning patterns of the gated (users). Other studies related to this, show the effects of online videos to learning (Montazemi, A. R., 2006; Lawson, T.,

Bodle, J., Houlette, M., & Haubner, R. 2006; Brecht, H. D., & Ogilby, S. M. 2008), and also varied bandwidth algorithms and requirements designed to meet the requirements for online video (Anjum B., Perros H., Mountrouidou X., Kontovasilis, K., 2011; Geleji G., Perros H., 2013 and Anjum B., Perros H., 2014).

2.6 Contribution and Implication for Further Studies

The product from this work cannot be taken and generalised to other universities or campuses without some slight modifications. This is because other universities may have more or less in the aspect of bandwidth than the university under study. However, the contributions this work hopes to make are a general understanding of the role bandwidth plays to accessing online video and thereby enhancing learning. Also, a scholarly referral base for more researches into bandwidth, online video and learning.

2.7 Summary of the Review

In this chapter, research paradigm was explored, discussing the philosophical assumptions for the study and putting into perspective what research paradigm is and its role in in studies. The paradigm adopted for the study was the interpretive paradigm.

The chapter also discussed the network gatekeeping theory, stating its inception (gatekeeping) and showing why the network gatekeeping theory is appropriate for the study. Also reviewed were previous studies that also used the theory from a variety of fields, their objectives for the studies, methodology, and their findings highlighted, and discussing the various constructs of the theory. The principles (gate, gated, network gatekeeper, gatekeeping, gatekeeping mechanism, power, relationship and information

production ability) were discussed with a view to creating better understanding of the theory.

References

Abendroth, D., & Killat, U. (2005). Effective bandwidth shaping: a framework for resource dimensioning extended version. Computer Communications, 1-8. Retrieved February 18, 2015, from http://www.sciencedirect.com/science/article/pii/S0140366404004074

Abidin, H. Z., Yusof, Y. M., & Suliman, I. S. (2014, December 11). Eprint. Retrieved from Digital repositories software and services: http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&uact=8&ved=0CC0QFjAC&url=http%3A%2F%2Feprints.uitm.edu.my%2F6735%2F1%2FLP_HUSNA%2520%2520ZAINOL%2520ABIDIN%252008_24.PDF&ei=QSeIVOn4DofnygOq_4II&usg=AFQjCNFtbg10cCqHnJGd1zCOe1uea7CQsw&

Aikenhead, G.S. (1997). Toward a First Nations cross-cultural science and technology curriculum. Science Education, *81*, 217-238.

Anjum B., Perros H. (2014). "Bandwidth estimation for video streaming under percentile delay, jitter, and packet loss rate constraints using traces", Computer Communications.

Anjum B., Perros H., Mountrouidou X., Kontovasilis, K., (2011). "Bandwidth allocation under end-to-end percentile delay bounds", International Journal of Network Management, Wiley, vol. 21, no. 6, pp. 536–547.Authentication Mechanisms," The Computer Journal (36:3).

Bantz, C. R. (1990). "Organizational Communication, Media Industries and Mass Communication," In Communication Yearbook, J. Anderson (ed.) 13, Sage, Newbury Park, CA, pp. 133-141.

Barzilai-Nahon, K. (2004). Gatekeepers and Gatekeeping Mechanisms in Networks. Unpublished PhD dissertation, Tel-Aviv University, Tel-Aviv.

Barzilai-Nahon, K. (2007). Toward a theory of network gatekeeping: A framework for exploring information control. Journal of the America Society for Information Science and Technology.

Barzilai-Nahon, K. (2008). Gatekeeping: A Critical Review . Annual Review of Information Science and Technology.

Barzilai-Nahon, K. (2011). Fuzziness of Inclusion / Exclusion in Networks. International Journal of Communication, 5, 756–772.

Bastos, M. T., Raimundo, R. L. G., & Travitzki, R. (2013). Gatekeeping Twitter: message diffusion in political hashtags. *Media, Culture & Society*, *35*(2), 260–270. http://doi.org/10.1177/0163443712467594

Blue Coat. (2009). Technical Brief*:* Bandwidth Management - Limiting Bandwidth. Sunnyvale, CA USA: Blue Coat Systems, Inc.

Brecht, H. D., & Ogilby, S. M. (2008). Enabling a comprehensive teaching strategy: Video lectures. Journal of Information Technology Education, 7, IIP 71- IIP 86.

Bui, C. (2010). How online gatekeepers guard our view - news portals' inclusion and ranking of media and events. *Global Media Journal*, *9*(16), 1–41.

Case, D. O. (2007). Looking for Information. In B. R. Boyce (Ed.), A survey of Research on Information Seeking, Needs and Behavior (Second Edition ed., p. 113). Burlington, USA: Elsevier Ltd.

Castells, M. (2011). A network theory of power. International Journal of Communication, 5, 773–787.

Cisco. (2013). Cisco WebEx network bandwidth. Retrieved from Web Conferencing and OnlineMeeting:http://www.cisco.com/c/en/us/products/collateral/conferencing/webex-meeting-center/white_paper_c11-691351.pdf

Coddington, M., & Holton, A. E. (2013). When the gates swing open: Examining network gatekeeping in a social media setting. *Mass Communication and Society*, (October), 130621104548001. http://doi.org/10.1080/15205436.2013.779717

Deetz, S. (1996). Describing differences in approaches to organization science: Rethinking Burrell and Morgan and their legacy. Organization Science, 7, 191–207.

Donohue, G.A., Tichenor, P.J., and Olien, C.N. (1972). "Gatekeeping: Mass Media Systems and Information Control," In Current Perspectives in Mass Communication Research, F. G. Kline and P. J. Tichenor (eds.), Sage, Beverly Hills, CA, pp. 41-70.

Gao, H., Knight, J. G., Yang, Z., & Ballantyne, D. (2014). Toward a gatekeeping perspective of insider-outsider relationship development in China. *Journal of World Business*, *49*(3), 312–320. http://doi.org/10.1016/j.jwb.2013.06.002

Geleji G., Perros H. (2013). "Jitter analysis of an IPP tagged traffic stream in an {IPP, M}/M/1 queue", Annals of Telecommunications, vol. 69, nos. 5–6, pp. 283–294.

Goode, L. (2009). "Social news, citizen journalism and democracy". New Media & Society (2009), vol. 11(8): 1287–1305.

Harorimana, D. (2012). The Gatekeeper and the knowledge environment- who they are , how they work Empirical evidences from High-tech Manufacturing and R & D Firms, (January).

Hogan, A. J., & Lakey, D. J. (2012). Duration and Bandwidth Limiting. (J. Benedetto, Ed.) New york, London: Springer.

Hoskins, A., & O'Loughlin, B. (2011). Remediating Jihad for Western news audiences: The renewal of gatekeeping? Journalism: Theory, Practice and Criticisms, 12(2), 199–216.

Kenny, R., & Broughton, T. (2013). Domestic demand for bandwidth An approach to forecasting requirements for the period 2013-2023, (November). Retrieved from http://www.broadbanduk.org/wp-content/uploads/2013/11/BSG-Domestic-demand-for-bandwidth.pdf

Kim S and Varshney PK (2005) Adaptive online bandwidth allocation and reservation for QoS sensitive multimedia networks. Computer Communications. Volume 28, Issue 17, 17 Oct

Kuhn, T. S. (1962). The Structure of Scientific Revolutions (Vol. II)

Kuhn, Thomas (1977). The Essential Tension: Selected Studies in Scientific Tradition and Change. University of Chicago Press. pp. 320–39

Lawson, T., Bodle, J., Houlette, M., & Haubner, R. (2006). Guiding questions enhance student learning from educational videos. Teaching of Psychology, 33(1), 31-33.

Lewin, K. (1947). Frontiers in Group Dynamics: II. Channels of Group Life; Social Planning and Action Research. Human Relations, 1, 143-153.

Lewin, Kurt. (1951). Field Theory in Social Science: Selected Theoret- ical Papers. Ed. Dorwin Cartwright. New York: Harper.

Meraz, S., & Papacharissi, Z. (2013). Networked Gatekeeping and Networked Framing on #Egypt. The International Journal of Press/Politics, XX(X), 1-29. doi:10.1177/1940161212474472

Montazemi, A. R. (2006). The effect of video presentation in a CBT environment. Educational Technology & Society, 9(4), 123-138.

Olsen, M. E., Lodwick, D. G., & Dunlap, R. E. (1992). Viewing the world ecologically. San Francisco: Westview Press.

Putnam, R (2000), Bowling Alone: The Collapse and Revival of American Community, A

Reeves, T.C., & Hedberg, J.G. (2003). Interactive learning systems evaluation. Englewood Cliffs, N.J.: Educational Technology Publications.

Shalangwa, A. D. (2014). Evaluation of bandwidth performance in a corporate network by using simulation model. Journal of Engineering and Technology Research, 6(1), 1-5.

Shoemaker, P., (1991). Gatekeeping, Sage Publications, Newburry Park, CA. Touchestone Book.

Wainwright , A. (2015). How to improve your school wireless network with WAN optimization. Retrieved June 01, 2015, from SecurEdge Networks: http://www.securedgenetworks.com/mobility-blog/How-to-improve-your-school-wireless-network-with-WAN-optimization

Weber, M. (1946), "Politics as a Vocation," In From Max Weber: Essays in Sociology, H. Gerth and C. Wright Mills (eds.), Oxford University Press, New York, 1946, pp. 77-128.

Ying, L., & Basu, A. (2005). pcVOD: Internet Peer-to-Peer Video-On-Demand with Storage Caching on Peers. In *DMS* (pp. 218–223).

Zviran, M., and Haga, J. (1993). A Comparison of Password Techniques for Multilevel Authentication Mechanisms, The Computer Journal, vol. 36 no.3

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter presents the methodology adopted for the study. Under the following headings; the research method and design, the population, sample and sampling techniques, data collection instrument, validation of the instrument, reliability of the instrument, data collection procedure and the statistical techniques used in analysing the data.

3.1 Research Method Adopted and Design

The study adopted a qualitative research method. Qualitative research methods were developed in the social sciences to enable researchers to study social and cultural phenomena. According to Creswell (2003), qualitative research takes place in a natural setting. He states that the qualitative researcher often goes to the site of interest to observe the participants. This enables a high involvement and a level of familiarity and detail about the participants in the research. The choice of this methodology is based on its appropriateness in gathering data and its emphasis on processes in their natural settings (Philip., 1998; Creswell., 2003; Denzin & Lincoln., 2003; Myer., 2009). For the purpose of this study, a case study research design was adopted. Case study is one of the best ways scientists use to investigate a current phenomenon and explain why certain outcomes may happen (Arenius 2002; Yin 2003). As stated by Vissak (2010), a case study research is very useful as it allows expanding and generalizing theories especially in areas that have not attracted much previous research attention. Hence, based on the researcher's knowledge of works in the university, research works regarding the roles and impact of

bandwidth managers are next to non, as such a case study was deemed appropriate to investigate the phenomena. Case study, is a strategy for finding out what the social scientists intends to find out and to determine the best way or methodology to do it. A case study sets out to collect, organize and summarize information about the population being studied.

Gillham (2000) defines a case study as an investigation to answer specific research questions which seek a range of different evidences from the case settings. Similarly, Yin (2003), defines a case study as an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly defined. The case study approach is especially useful in situations where contextual conditions of the event being studied are critical and where the researcher has no control over the events as they unfold. Given the stated advantages, the case study was deemed the most appropriate design for the study.

3.2 Population of the Study

Population is a well-defined collection of individuals or objects known to have similar characteristics and the entire entity of interest to the researcher (Ifidon, and Ifidon, 2007). The population for this study comprised of all fifteen (15) staff of the Network Infrastructure and Security Services Unit (NIS) which is a component of the Information Computing and Information and Communications Technology directorate (ICICT).

3.3 Sample and Sampling Techniques

Sampling is defined as selecting a proportion of an entity or a subset, (Rudolph, 2002). In qualitative researches, samples are not chosen to be statistically representative of

the population, they are chosen for a purpose. Hence, the sampling method adopted for this study was purposive sampling. According to Muranda (2004), purposive sampling is a non-probabilistic method of determining samples to arrive at the needed sample. Similarly, Ndagi (1999), corroborated that purposive sampling procedure relies on the judgment of the researcher when it comes to selecting the units (e.g. organization, people or events) that are to be studied.

For this study, the sample units were chosen because they had particular features or characteristics which enabled detailed exploration and understanding of the central themes and puzzles for which the researcher wished to study. It involves selecting participants who are best able to help or aid the researcher understand the problem and answer the research questions (Creswell, 2009). Sample participants for this study were based on the following criteria;

1. Must have been a staff of the unit for at least 8 years and currently working in the unit. The central reason for this criteria is based on the recent upgrades that have taken effect in the university. Such respondents would have a working knowledge of what was and what is available presently.
2. Must be directly involved in one way or another in the managing of the universities bandwidth. As not everyone in the unit is into the Monitoring, Security and or Administration of the universities bandwidth.

Based on the above, three (3) out of a total population of fifteen (15) met the study criteria and hence formed the sample for the study.

3.4 Instruments for Data Collection

The research made use of semi structured interview questionnaire and observation for collecting data in the study. These research instruments were used jointly, based on their advantages as presented by Akuezuilo (1993), that these research instruments when used are more economical in terms of their ability to provide valued response from all respondents. The interview involved the researcher personally interviewing staff of the NIS, based on a structured set of questions (Semi-structured Interview) that had been prepared before the interview. **See appendix 1 Pg. 81**

3.4.1 Semi-structured Interview

Interviews are qualitative research tools that are meant to explore in-depth, of a respondent's perception, understanding, feelings, and perspectives. Aina (2004), further added that, this process has the advantage of encouraging the researcher to explain confusing or ambiguous research phenomenon in detail. Poindexter & McCombs (2000), submit that "one-on-one interviews are most beneficial as a research tool when the topic being explored involves change, novelty, or uniqueness and the people interviewed play influential or unique roles"

The semi-structured interview is a tool which is meant to guide the researcher based on a set of pre-designed questions and aid the whole process of the interview. The semi-structured interview is made up of structured open ended questions, this semi-structured interview is meant to offer an opportunity to the bandwidth managers (gatekeepers) to talk and express their ideas. The interview was used to elicit the perceptions of the selected sample on what informs the bandwidth management of users (gated) in the university.

3.4.2 Observation

Observation here involved the use of eyes rather than ears and the mouth. Direct observation of attitudes, facilities, equipment and processes involved in bandwidth allocation or limitation was done and corroborated with statements in the interview.

3.5 Rigor in Qualitative Research

Any research aspiring to stand up to critical examination, must show reliability and validity. Hence the norm of rigor in qualitative studies, which aids in determining whether same result can be achieved in another study if conducted using the identical research methods, while validity in qualitative research is related to deepening the understanding of the qualitative data. This phase in qualitative research seeks to confirm whether the findings of the study can be relevant beyond the case study and the context of the research (Yin, 2009). The question of validity centres around bias and three issues: (a) accuracy in terms of asking the right questions; (b) accuracy in terms of the precision and details of the data; and (c) accuracy in terms of the truthfulness of the information gathered (Blaikie, 2000; Scandura & Williams, 2000; Creswell, 2003; Hardy & Bryman, 2004; Denscombe, 2007). These research procedures were established in order to construct validity for the research. This according to Yin (2003) is a tactics to increase the quality of construct validity during the data collection phase.

For rigor to be achieved in qualitative research, there is a need for detailed description of the methods used in the research during preparation for field work exercise, data collection process, transcribing, coding, analysis and presentation of research findings (Ritchie and Lewis, 2003). It is argued that this helps to solve the problem of reliability and validity,

thus improve the quality of case studies when applied. On the trustworthiness of this research pertaining to the perceptions of bandwidth managers on accessing online video content for learning in Ahmadu Bello University, Zaria, the research uses the criteria by Lincoln and Guba (1985): Credibility, Dependability, Confirmability and Transferability to presents the research methods and findings in a transparent and honest manner.

Credibility: the research aimed at achieving credibility in the process of coding by constantly looking for reoccurring themes between the various respondents. By doing so, credibility was established from data obtained.

Dependability: The technique employed to establish dependability was an inquiry audit. The researcher adopted an external audit technique. The external audit involves other researchers that were not involved in the research process. They examined the process and product of the research study. The purpose here being to evaluate whether or not the findings, interpretations and conclusions are supported by the data.

Transferability (Fittingness): showing that the findings have applicability in other context. The techniques that can be used in ensure transferability is thick description. Thick description as described by Lincoln and Guba (1985) is a way of achieving a type of external validity. By describing a phenomenon in sufficient detail one can begin to evaluate the extent to which the conclusions drawn are transferable to other times, settings, situations and people. The research provides enough information in order to decide if the findings are meaningful to people in similar situations.

Conformability: this is the degree of neutrality or the extent to which the findings of a study are shaped by the respondents and not researcher bias, motivation or interest. Techniques for establishing conformability according to Lincoln and Guba (1985) are

confirmability audit, audit trail, triangulation and reflexivity. The researcher used triangulation of different data collection in order to confirm responses from participants. Also an audit trail (a record of how decisions were made throughout the study) was used to describe the research steps taken from the start of the research project to the development and report of findings. Some of the actions taken by the researcher to enhance the reliability of this study include ensuring the questions were clear to the participants who took part in the interviews.

3.6 Procedure for Data Collection

The researcher personally visited the site under study and administered the interview to respondents. To ensure confidentiality all respondents obtained for the interview were assured that their names and other credentials that could be used to identify them would be kept secure and used solely for the purpose of research. The researcher spent a total of three weeks in the observation of processes.

3.7 Procedure for Data Analysis

The process of the data analysis means that the researcher creates meaning from the raw data gathered. Data analysis involves a number of stages namely; data management; generation; interpretation and presentation (Creswell, 2009; Yin, 2009). In this study, data analysis involved organising the data, inspecting the data for emerging themes, developing categories and coding the data into these categories. The data that was obtained was first organised, then transcribed as is (verbatim). Subsequently the researcher imported the transcribed data onto Nvivo software and set up nodes(categories), based on the research

question. Coding was done to be in line with the already defined research questions before the interpretation of coded data which answered the research questions began.

References

Akuezuilo, E.O. (1993). Research Methodology and Statistics: NUC/NBTE Minimum Standard Edition. Akwa: Nuel Cent (Nig.) Publishers.

Arenius, P. M. (2002). Creation of firm-level social capital, its exploitation, and the process of early internationalization. (Doctoral dissertation, Helsinki University of Technology, Espoo). Retrieved April 1, 2013, from http://www.tuta.hut.fi/units/Isib/research/bg/Arenius2002.pdf

Best, J.W & Khan, J. V. (2007). Research in Education, 9th Edition. New Delhi: APH Publications.

Blaikie, N. (2000). Designing Social Research. London: Polity.

Cohen, L. & Manion, L. (2000). Research Method for Education, 5th edition. London: Clive Bingley

Creswell, J. W. (2003). Research design: Qualitative & quantitative approaches (2nd ed.). Thousand Oaks, CA: Sage.

Denzin, N. K., & Lincoln, Y. S. (2003). The landscape of qualitative research: theories and Issues. Thousand Oaks, Calif., Sage.

Denscombe, M. (2007). *The Good Research Guide small-scale social research projects* (3rd Edition). Open University Press McGraw-Hill.

Gillham, B. (2000). Case Study Research Methods. London: Bill Gillham.

Hardy, M. & Bryman, A. (2004). Handbook of data analysis. London: Sage Publications.

Lincoln, Y. S and Guba E. G (1985) Naturalistic Inquiry. Newbury Park, C A: Sage Publication

Muranda, Z. (2004). Dissertation Writing: Concepts and Practice. Harare, Zimbabwe:university of Zimbabwe publications. P.20-59

Myers, M. D. (2009). Qualitative Research in Business & Management. London: Sage Publications.

Ndagi, J. O. (1999). The Essential of Research Methodology for Nigerian Educators. Ibadan;University Press PLC

Osuala, E.C. (1997). Introduction to Research Methodology. New Revised Edition. Onitsha:Africana-Feb Publishers LTD

Paly, T. (2012). Purposive Sampling Techniques. Simon Fraser University Pennsylvania: The Sage Press

Philip, L. J. (1998). Combining qualitative and quantitative approaches to social research in human geography: An impossible mixture? Environment and Planning, 30(2), 261-276.

Poindexter, P., & McCombs, M. (2000). Research in mass communications: A practical guide. Boston: Bedford/St. Martin's.

Scandura, T. A., & Williams, E. A. (2000). Research Methodology in Management: Current Practices, Trends, and Implications for Future Research. Academy of Management Journal, 43, 1248–64.

Sulaiman, S. N. (2007). Fundamentals of research. Lagos: Sanbio-Nes Publishers Limited.

Suleiman, S. (2008). Researchers Companion: Key to Effective Research Writing. Kano: Samarib Press

Yin, R. K. (2003). Case study research: Design and methods (3rd ed.). Thousand Oaks: Sage Publications.

Yin,R.K.(2009). Case Study Research: Design and Methods. London: SAGE Publication

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF RESULTS

4.1 Introduction

The purpose of this case study was to explore the perceptions of network managers on information control and accessing online videos in the ABU, and to better understand if these perceptions are responsible for the slow buffering of videos while on the university campus. The study was guided by four basic research questions;

1. How do network gatekeepers perceive their gatekeeping role on ABU network?
2. What factors do bandwidth network gatekeepers consider in the limitation of bandwidth?
3. How does information control and gatekeeping mechanisms influence access to online video content?
4. How does the network gatekeeping theory explain the perceptions of network managers on information control and accessing online video in ABU?

The study designed a semi-structured interview guide to answer the above research questions. The responses obtained from the in-depth interview were transcribed word for word (verbatim), the transcribed data were imported onto Nvivo software, coded and analysed. The transcripts produced 107 codes, 10 sub categories and 4 major categories. It is upon these categories and subcategories that the analysis for this study were based.

4.2 Realization from sample

This section highlights on a major upgrade that had been undertaken within the university and also demographic characteristics of the sample to lay a background

understanding of the study population and problem. Based on the already established criteria that a respondent must have worked in the university for a minimum of 8 years and must be involved in one way or the other in the management of bandwidth, the participants that met the study criteria base were three (3), they had a working knowledge of all the challenges faced and recent upgrades that had occurred in the university. An excerpt of such development as given by the respondents;

> *"Initially we were using wireless systems as our backbone and access, you find out that, (at) that time we only have eight (8) megabyte of bandwidth and ehn… but today everywhere within this campus is cabled with fibre cable (backbone)."*

The biographic information collected for the study was related to certifications done and years of experience, names and job designations are not detailed to ensure the respondents' confidentiality. The years of experience and certifications of the participants ranged from eight to ten years with varied certifications: Certified Fibre Optic Technician (CFOT), Cisco Certified Network Associate (CCNA), Cisco Certified Network Professional (CCNP), RedHat Certified Engineer (RHCE), Mikrotik Certified Network Associate (MTCNA) and Certified Ethical Hacker (CEH). This implies that the respondents have the basic technical know-how and understanding needed to implement, secure and maintain the university's network.

4.3 Data analysis

The analysis of data was a narrative analysis of themes that emerged from interviews which lasted for approximately 2hr: 12mins. This analysis is a presentation on the

perceptions of network managers on information control and accessing online videos at Ahmadu Bello University. The section that follows is a presentation of the themes that emerged from the interviews. The emergent themes are highlighted with summarized quotes and excerpts taken from the interview, and then a discussion of the themes with pertinent quotes from the literature follows.

4.3.1 Network gatekeepers' perception on their gatekeeping role

A Network gatekeepers (administrators) role, often requires them to be proactive and have the following attributes adaptability, ability to learn, desire to learn, software fluency, tenacity, attention to detail, responsiveness and recognize Information Technologies role and how it helps attain the goals of the organisation). Their job roles as network gatekeepers are varied but not limited to; ensuring the security of an organization's network from threats originating from inside and outside the organization, writing network security policies and service level agreements, ensure that these security policies are up-to-date, performing frequent audits, ensuring that security policies are being followed, and finally ensuring the effective and smooth running of all networked systems. The way and manner network gatekeepers perceive their roles within a network, has a direct influence on their goals, functioning and the management of such network. This implies that if a network gatekeeper sees his role as singly one sided other responsibilities will suffer due to this fact, large organizations are in the habit of sharing some of the responsibilities of the network administrator or hiring more individuals and breaking up their various tasks (Sondegard, P. 2005; Metzler, J. 2011). Of the all interview questions pertaining to perception of gatekeeping role, one major category emerged with two emergent sub categories. They were;

1. Security of the network (Monitoring, Blocking, Limiting and Usage)
    i. Job responsibility
    ii. Challenges in performing the job

Security of the network (Monitoring, Blocking, Limiting and Usage)

From research question one, the major issues raised was security. Research question emerged with one (1) major category with two sub categories which depicts the perceptions and understandings of the network gatekeepers towards their role as managers of the network. When the network gatekeepers were asked how they perceive their roles, their responses were skewed towards security of the network and monitoring the network devices for reliability and maintenance purposes. For instance, one of the respondents noted:

> *"We have network monitoring tools that helps (enables) us monitor active devices, use, monitor bandwidth usage, monitor how end users uses the university network. What we look out for mainly are; reliability, performance and availability".*

Similarly, another respondent noted that as a result of piracy, copyright and pornography, they had to resort to blocking and securing the network through the use of firewalls:

> *"Advanced countries are bringing issues of piracy, issue of ehn… is it plagiarism if not the internet is supposed to be a free world you can do whatever you want to do that's the basic, that's how internet is built initially. On our network everything is open to everyone as long as you're not downloading virus, if you're*

downloading any virus in fact it will block you from downloading it.

you can't go to torrent on our network because it's an academic environment, you know copyright issue, people will be downloading other people's materials free of charge".

Respondent's perceptions on users were users tended to abuse the network if there wasn't some form of restrictions.

"I know that most of the youth nowadays like downloading films. Am I not right? So that is the problem. That is why we limit them".

"You know really, if you allow everybody there would be a point that nobody can do anything. It is just like a kind of bandwidth management 'ka gane' (you understand) to allow people use it and everybody enjoy it".

As the perceptions of the respondents in the description of their role as network gatekeepers' primarily tended towards security, monitoring and limitations of bandwidth, it implies that the overall quality of experience of users streaming online video is not put into consideration and would suffer a great deal as the network gatekeepers put more consideration into the security and monitoring of their devices and the use of the network. Based on these views of users being abusive of the network infrastructure, it is believed that there would be some sort of guiding principles (security policy), that stipulates what is acceptable on the network.

Job responsibility

In the course of trying to explain their perception of their roles as network gatekeepers the respondents went on, linking it to their day to day responsibilities on the job, one respondent said;

> "*Well you can just say maybe your responsibility, office responsibility dealing with switches, routers and servers. Configuring switches, routers and then servers"*

> *"We see their performance, monitor their performance if there is any issue we tackle it. Then planning, here we do network planning and management. So we plan, design then implement."*

Another respondent view was:

> *"At the moment what we do in this unit, we are responsible for traffic flow and to make sure active devices. I do wireless networking like the back of my hand and then wired and then configuring devices. What we try to do, is we try to make sure the uptime should be at least 99% uptime of all our active devices."*

Likewise, another respondent noted that *"it is our duty 'ka gane' (You understand) to fish out and see who is using more bandwidth, we can trace the person's through his IP (Internet protocol address) 'ka gane' (You understand), to where he is and, with the login, if it is a student, you know we use their matric number and with this we know which department he is."*

The responses above showed that aside the view of network gatekeeping role being on security alone, they also felt that their role as network gatekeepers were reflected in the functions and performing of their day to day activities. However, in describing these job responsibilities their opinions and views still echoed on security with terms like monitoring, traffic flow and fishing out re-emerging. Being that a vast majority of their job description would keep the network gatekeepers in their offices, it means that they have little or no time to interact with users to educate, enlighten and understand the needs of these users. As noted in a response these activities did not come without their own challenges. These challenges are highlighted in the next category.

Challenges: Issues on finance, capacity building and low staffing capacity were challenges reportedly faced by the network gatekeepers in performing their tasks. With regards to this one respondent had this to say; "*Our challenges is (are) just government policy (management), then on capacity building too there is not enough training you know people should be trained very well for ease of the work because if you're not trained well you may be doing some things out of ignorance but once your trained you will know what to do that will help the system."*

This challenge of funding and government policy also affected the amount of bandwidth they were able to afford as one respondent reported bitterly when asked strategies undertaken towards augmenting the available bandwidth. His response was "*Well it's a matter of money, like I told you it's one of the problems you request for something and the management tell you there is no money."*

Aside the problem of low funding and bureaucracy the network gatekeepers faced other challenges, these challenges stem from users and method of authentication. Users seemed to constantly report problems with their login details and upon investigation it was observed that simple case error (upper case/lower case) and forgotten passwords seemed to have been the cause of the problems. This is reported in the next response. *"You know sometimes mostly people forget their password that is the major problem or some they don't know how to use it. You know like staff now they don't add "P" with their personnel numbers and for the students, they use capital "U" instead of small "u" ka gane (you understand) and that is the problem most at times."*

Analysis of the reports gotten on perceptions of roles above shows that the respondents pay high credence to security and deem that as their sole job responsibilities. Hence, much credence is not paid to user satisfaction.

4.3.2 Factors network gatekeepers consider in the limitation of bandwidth

An understanding of factors that are considered in the provision of bandwidth is essential, in order to understand the dynamics behind the limitation of said bandwidth. As such responses on the reasons for this were sought because the factors considered in limiting bandwidth impacts a great deal on the online video streaming. In trying to understand the rationale behind limiting of bandwidth, respondents were asked the factors they considered before such actions were carried out and there was an observable uniformity in the responses obtained. From the questions asked, emerged one (1) main category and four (4) emerging sub-categories.

Bandwidth Availability and Abuse

Bandwidth plays a vital role in an information network, as established in previous chapters, "bandwidth is responsible for data transfer speeds, therefore the bigger the bandwidth quota, the quicker the connection speed. These bandwidth speeds however great, if not managed right would still be inadequate". The responses gotten from this established that availability of bandwidth was a major consideration to the limiting of bandwidth within the university. These responses are captured below

> *"When we started we only had like 8mb but when we upgraded to fibre we upgraded it to 155mbps then we have another 155mbps so making it like 310 mbps but currently the other one is down the service provider have some challenges so we are back to 155mbps."*

> *"people are just saying bandwidth optimisation, Me, I don't believe in that, bandwidth can sometimes never be enough"*

> *"The bandwidth we are getting from our internet service provider (ISP) is STM 1 which is one hundred and fifty-five megabytes per second (155Mbps)."*

Also, a notion that users abuse the available limited bandwidth contributed to the limitations in the amount of bandwidth a given user could attain. A network gatekeeper stated that *"if you have a limit, you can only use that certain limit. But if you don't have limit everybody can just do whatever they want.* He further stated, *"if you allow everybody to be unlimited, there would be a point that nobody can do anything"*. From the limiting,

two classes of users emerged as stated in the response of another network gatekeeper *"for staff here in the university, we assign limit of 1mb while student we give them 513kb."* This was done based on the length of time users stayed on the network as noted in the next statement. "*We considered staff only stay in the school like 8hrs in a day from 8am to 4pm that's like 8hrs, but students most of them are within the campus 24hrs so let's say they want to download a 1mb file, a staff can download it in 8hrs while students can download it in 16hrs."* Aside the limiting done to users, the network gatekeepers exercised a conscious disparity between various network users traffic, based on the status of the user within the university community.

> "*Here on campus we looked for a place that would likely pull a large amount of traffic, which is the place that we might need a 10 GB link we saw that it was the senate building and this is considered because of the principal officers because we don't want them to have bottle neck so we give them 10Gb link."*

Finance: Finance plays a key role in the ability and performance of a network and its gatekeepers. This is necessary for the procurement of bandwidth other network infrastructure and their maintenance. As reported by a respondent the network was faced with the problem of dwindling resources. *"you may request something, they will say there is no money, you will say you need a server or maybe a switch.* As stated above bandwidth costs money, this in turn hampers the amount of bandwidth the university can afford. The resultant effect of low funding as regards to procurement of bandwidth is reported by the next respondent;

"We are almost at our peak and then when you try to browse now, you can see that the network is dragging because everybody is browsing all kinds of things, the bandwidth could (would) choke and then network traffic could (would) start crawling, so now in checking the performance we use usage against available bandwidth, so definitely, it would affect performance because we have more users now on the network. Now to improve it is to buy a much bigger bandwidth."

Bottlenecks on the Network

This category highlights some of the challenges faced by the users on the network. From previous responses, a major challenge on the network was the available bandwidth for the entire university. This issue raised the question of the number of active devices that are on the network against the available bandwidth, the response gotten showed that the number of active devices far exceeded the available bandwidth resulting in bottlenecks and congestion. This conclusion is captured in one response given as thus *"I can tell you of 1600 concurrent users who are using the network at a time. So those that are using the network are much. That is why you realize that by the time it is peak period, the network becomes slow and begins to lag."* The response is in line with the statement of Michael Welzl (2005), "Congestion occurs when resource demands exceed the capacity, and from the end users' perspective, this congestion is observed if the service quality noticed by the user decreases because of an increase in network load." Other responses on the issue of bottlenecks showed that using low performance devices within the network could also create bottleneck. For example, *"the amount of traffic or request overwhelms the switch*

and instead of having a 6500 catalyst switch you put in 3750 switch, you know for sure that the performance for this two devices aren't the same as such bottleneck is expected." He also stated that *"instead of having device that uses a gigabit Ethernet port and you decide to use the Ethernet port, for sure it would limit the traffic going in and out of it. So this is some of the things that can cause bottleneck."*

Strategies for optimizing bandwidth

On the strategies for optimizing bandwidth the respondents expressed unanimous views with one particularly expressing his disbelief in the optimization of bandwidth. When asked if he thought that bandwidth can be optimized, His response was *"Sincerely I don't believe in that; they only thing you can do on a network is just not to allow everybody to use the whole bandwidth".* The response shows a strong belief that users if given the opportunity will abuse the network resources. In light of this, further responses on the strategies used for the optimization of bandwidth were sought out. A respondent reported that formerly the use of proxies was adopted to enhance the networks however due to the active growth of the Web these proxies were actually not doing a very well.

> *"Proxy is actually one of the solutions that were used. The essence why proxy was used is to aid slow network but it is actually not working. This is because most sites nowadays are dynamic and so proxy server cannot capture the site, because most of the sites are changed every few minute."*

Orientation on the bandwidth use

This category stems from the responses gotten on Security. As one respondent rightly state "o*n our network everything is open to everyone as long as you're not downloading virus, if you're downloading any virus in fact it will block you from downloading it. Or you're downloading torrent you can't go to torrent on our network because it's an academic environment".* This category sought to understand the level of awareness of users on such policies. To answer this, the respondents were asked questions on orientation and sensitization of users on the use of bandwidth and their response are noted below. The responses gotten indicated the presence of some form of policies however, the policies were not in any structured or written form as seen in the next response: "*We developed the acceptable user policy and ehn… then the policy itself, we have given that to the management for approval. When they finish that we can publish the document and anybody coming to request for login (username and password) would be given you a copy. But up till now the management has not approved the policy. So that why you can't do anything. On that policy, you see what and what you should do and what and what you shouldn't do. But up till now it's still with the management."* He stated in frustration that *"it had been more than five years, since the submission of the policy, Everyday its one story or the other."*

4.3.3 Information control and gatekeeping mechanisms influence on accessing online video content

This category explores influence of gatekeeping, gatekeeping mechanisms on online video streaming and the bottlenecks in the network that affect this online video

streams. Responses received indicated that there is a direct influence of gatekeeping mechanism on online video streaming. The response received points to the importance of online videos as educational resources, and to this end, a respondent noted that "*the environment where we are, is an institution and you may have users streaming online some may even visit porn site, movie, music and etc. now for some students in theatre art, who access YouTube to access videos on dance steps, from a video that is on a server in US or in UK now students can't be denied the usage of YouTube".* In answering the question of the influence of mechanism on online video streaming, one respondent noted that there were actually effects, while another collaborated and further explained that "*bandwidth is limited so definitely you must experience video buffering when doing video streaming, but when your bandwidth is enough it won't affect it."* The view of a respondent ushered in questions on gatekeeping, gatekeeping mechanism, online video and prioritization of web traffic and protocols.

Devices used in Gatekeeping

This category sheds more light on gatekeeping mechanism and online video. A respondent response suggested that the use Fast Ethernet port instead of Gigabit port would affect online video streaming. His response showed that fibre optic links should drop into gigabit ports for end users rather than on fast Ethernet port because "*fast Ethernet is 100mbps while gigabit is 1000mbps"*. This disparity in port speed between fast Ethernet and gigabit port suggests that the performance of gigabit port exceeds that of fast Ethernet port. A respondent further noted that these devices (gatekeeping mechanisms) used to perform the task of the gatekeeping have a lifespan and once they hit their lifespan, their performance

begins to dwindle thus affecting online video packets. The category further explores the various software devices used in carrying out gatekeeping operations. The response gotten shows that both software and hardware were pivotal in managing the university's networks. These responses are captured as thus "*we have a device called* ***unified threat management****. This device serves as a firewall for the network"* The above response shows that the network is susceptible to security breach and attacks, hence the need for a firewall to check and protect the network from these attacks. Furthermore, a respondent described a software used in managing the user's profile i.e. creating usernames and passwords for users. In his response he states that *"user manager gives us the chance to create users profile that is, we can add a user so that he can access the university network."*

Another respondent described a network monitoring device used in monitoring user's activities *"Nfsens is the application that we use for network monitoring, monitoring end users and types of services that end users are using. With it I would be able to know the site a user is accessing.* The response indicates the presence of an active network monitoring tool through which sites visited could be determine, it also indicated that traffic could be monitored as well, hence the question of prioritization of these traffic. The following response indicates that video and voice traffic requires more bandwidth than text hence the need for prioritization of these data packets.

> *"If you are doing bandwidth allocation, you are saying we give priority to data, voice and video why do we do that, we do that because we want to ensure quality of service (QoS). Now because you know that video is very important when it comes to bandwidth, if you don't give video good bandwidth you know for*

sure you won't get quality picture, the same applies for voice, but the least is data because with small bandwidth, data can function."

This is further buttressed in another study conducted on Internet Protocol (IP) traffic in ABU, Zaria Network where it was found that 75% of the total IP traffic on the university network were HTTP traffic while about 19% of the traffic were termed "other IP protocol". A closer look at the constituents of these HTTP traffic revealed that internet mail sites like Yahoo, Google and socializing sites like YouTube, Facebook etc. constitute not less than 50 % of the total HTTP traffic on the network (Adedokun E. A: 2009). Further enquiry on traffic prioritization highlighted that no form of priority was given to any traffic within the network. A respondent stated "*NO!!(Emphatically), because when you see prioritizing that means you have a limited capacity."* He further noted that switches (Gatekeeping mechanisms) within the network were only at twenty (20) percent utilization. As such there was no need for prioritizing within the network. Enquiry into traffic exiting (leaving) the network also indicated that there was no form of prioritization. A respondent's view further indicated that video was not necessary as such there was no need to prioritize video traffic *"because there is no need. What are you doing with videos that's the question"* Information gathered on measures put in place to facilitate access to online video revealed the availability of offline servers which provides offline content. As earlier stated by a respondent "*Nfsens is an application we use for network monitoring ……. With it I would be able to know the site a user is accessing."* The ability to determine sites user's visit and availability of offline content raised the question on methods for redirecting user's traffic to this offline content. The respondent stated "NO (Emphatically)" to the question

of these redirection mechanisms and on the issue of channels for sensitizing users on availability of offline content, he noted "*That's not our job, our job is just to provide the services not to tell staff or students these functions are for the library*".

4.4 Discussion of Findings and Implications

The findings of this research will be discussed under the sub-heading of the research questions. Hence, the findings will answer the research questions of this research, in a conclusive manner in order to achieve the stated objectives of this study:

How do network gatekeepers perceive their gatekeeping role?

The findings of this study identified security of, and within the network as the main way network gatekeepers view their role on ABU network. With respondents using terms like monitoring, blocking and securing in the attempt to describe how they perceive their role. The responses obtained from the network gatekeepers showed that users had the tendencies of abusing and misusing the network infrastructure, through downloading and the use of various file sharing websites. As such, some forms of restrictions were imposed on them. However, the responses did not in any way indicate the efficiency of this method employed by the network gatekeepers. The implication of their gatekeeping perceptions is that users have a strained relationship with the network gatekeepers resulting in a one sided communication. This in turn affects the overall user satisfaction. Also, as a result of this kind of relationship network gatekeepers had with their gated(users), they gated (users) experienced challenges with their login details hence further limiting the overall online experience.

What factors network gatekeepers consider in the limitation of bandwidth?

The study also sought to understand the rationale and factors network gatekeepers considered in limiting and placing some form of restriction on bandwidth usage. The responses gotten were linked to a number of reasons among which the amount of bandwidth subscribed for the university was one. The network gatekeepers stated that the bandwidth available was 310Mbps. However, a link of 155Mbps was bad leaving them with only 155Mbps to manage. As a result of this setback they were forced to put every user of the network on a specific quota which could not be exceeded. Hence, online video streaming would suffer. hindering the browsing experience of all users. They also noted that users tended to over stretch the available internet facilities by hogging all the resources to themselves through constant downloading. The findings further revealed a lack of any available acceptable user policy or document stipulating what was acceptable on the universities network. The implication of this being a ripple effect which affects the network and the entire university as a whole. As users are not aware and properly enlightened their behavioural patterns would still remain the same once on the network as such the bandwidth and university network will continue to suffer as users continually complain over the poor state of the network. The findings further showed a lack, and total disbelief on optimization techniques for the available bandwidth, this invariably implies users attempting to stream videos on their already limited bandwidth will face further hardship, hence resulting in total abandonment of the information resource.

How does information control and gatekeeping mechanisms influence access to online video content?

The responses pointed out that though online videos were indeed valuable educational resources there was a direct influence of gatekeeping mechanisms on online videos. This influence being that the bandwidth capacity of the university and its students were limited, and as a result the time it would take to buffer a video file would be greatly increased. The findings indicated that gatekeeping mechanisms port speed had a major role to play in the quality of online video streaming as there were variances in port speed of devices within the network. Further analysis of the responses shows that various types of software and hardware were used in gatekeeping. The various software utilized all aided the information control functions (Monitoring, Security and User account creation). However, this software was not optimally utilized as user traffic such as video though monitored are not prioritized.

How does the network gatekeeping theory explain the perceptions of network managers on bandwidth and online video access?

An analysis of the finding revealed some form of conformity to the ideas expressed in the network gatekeeping salience theory. For instance, research question one shows that network gatekeepers adopt a one-sided gatekeeping being that that their primary focus is on security. As a result of this one-sided gatekeeping approach, a direct connection between user (gated) and network manager (gatekeeper) is lacking, as such a strained relationship exist. Analysis of the transcripts excerpts for research question three further buttresses this strenuous relationship with the network gatekeepers and gated as there was synergy between they and other gated (library) on the availability of offline content. Research question two highlighted that the network gatekeepers considered a power relationship in

the limitation of bandwidth. As explained by the theory, the power relationship comes to play when A (Senate) has the power to make B (Network gatekeeper) do what they would otherwise not do. Research question three (3) conformed with construct of information production ability. Being that the construct talks on the ability of the gated and gatekeepers to produce information. Network monitoring tools do not just enable the network gatekeeper limit bandwidth usage, but also enable them to know what the gated(users) are doing as well. The gated information production ability is shown in the high prevalence of online video streaming and downloading. As such, the network gatekeepers understand the needs of the gated (user) but still hold on to traditional gatekeeping values where the information production ability rest solely on the gatekeeper.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.0 Introduction

This chapter presents conclusion and recommendations for the study on perceptions of network managers on bandwidth and online videos streams in ABU. The chapter presented under the following sub headings

- Summary
- Summary of major findings
- Conclusion
- Recommendation
- Suggestion for further study

5.1 Summary

The major objective of the study was to explore the perceptions of network managers on bandwidth and online video streams in the ABU, Zaria. The study aimed at achieving three specific objective among which included: to identify the various perceptions of the network gatekeepers towards their gatekeeping role on ABU network and to ascertain the factors bandwidth gatekeepers of the university consider in limiting of bandwidth, to ascertain how information control and gatekeeping mechanisms influence access to online video, and to explore how the network gatekeeping theory explains the perception of network managers on bandwidth and accessing online video content.

In line with these specific objectives three research questions were raised which included: How network gatekeepers perceive their gatekeeping role on ABU network, the factors bandwidth network gatekeepers consider in the limitation of bandwidth, how information control and gatekeeping mechanisms influence access to online video content, and how the network gatekeeping theory explain the perception of bandwidth manager and online video access.

The study adopted a qualitative research method, and for the purpose of the study, a case study research design was adopted. The population of this study comprised of the entire staff of the Network Infrastructure and Security Services Unit, with a total numerical population of fifteen (15) out of which three (3) personnel met the criteria for inclusion in the research study. Purposive sampling was the sampling method adopted for this study and sample participants was based on the criteria that the participant; must have been a staff of the unit for at least 8 years, and must be directly involved in one way or another in the managing of the universities bandwidth. The research made use of semi structured interview questionnaire and observation for collecting data in the study. The researcher personally visited the site under study and conducted the interviews. The data that was collected from the research instruments was first organized and transcribed. The data collected was subsequently sorted, examined, compared, categorized, and synthesized. Finally, Chapter four contains the analysis and findings of the research.

5.2 Summary of Major Findings

Based on the data collected and analyzed for this study, the following are the major findings:

1. As the perceptions of network gatekeepers in the description of their role primarily tended towards security, resulting in a one-sided perception of their roles. Other necessary functions of network gatekeepers in todays' information era such as users' satisfaction tend to suffer, thus bringing about a poor quality of experience and service to users' online video streaming.
2. The study revealed that network gatekeepers took into consideration the bandwidth available, user activities(abuse) and time spent by users on the network as criteria before limiting the amount of bandwidth available to users. However, there was no form of sensitization on bandwidth use and what is acceptable on the network for users.
3. The study further revealed that as a result of the limitation of bandwidth, users' access to online video was hindered, and also the Port Speed (the maximum amount of data that can pass through a channel) and the lifespan of gatekeeping mechanisms had a role to play in the overall access to online video.
4. Finally, the findings of the study conformed to the constructs of the network gatekeeping construct, in areas like power of the gated in relation to the gatekeeper, their relationship with the gatekeeper and the information production ability of the gated and gatekeeper.

5.3 Conclusion

Network managers in the university held security of the network in high regard and had bureaucratic challenges. The power of the network gatekeepers over their gated is ever present in the University. A strained relationship exists between the network managers and the users. As established in previous chapters, the total amount a communication channel

carries (bandwidth) play a vital role in user connection speeds, but it was found that the university had only one working internet subscription as opposed to two. This affected the overall available bandwidth hence resulting in bottlenecks on the network. This and the perception of users abusing the network led to limitations of users' bandwidth, however there were no strategies put place to optimize the network, nor were there any means of orienting users on their use of the bandwidth bearing in mind that this bandwidth however great, if not managed right would still be inadequate.

5.4 Recommendation

In this study, recommendations are made based on findings and conclusion obtained from the study.

1. Network gatekeepers should not focus solely on security of the network as this hinders their other responsibilities such as customer services, orientation.
2. Due to the already limited capacity and ISP problems faced, other means of optimizing bandwidth for video and effective service delivery should be looked into. Example, synergy between units involved in information service delivery (Library and the NIS unit), mirroring of video hosting sites as offline content and allocation of data quota to users instead bandwidth limiting.
3. Management should take the role of NIS seriously and make futuristic plans (advisably every four years) to maintain the already established network facilities, bearing in mind that these facilities have a lifespan and their performance begins to dwindle as the age, thereby affecting the network performance.
4. The man-power for the network gatekeepers should be boosted and network gatekeepers (administrators) ought to know that they are in the business of

information service provision for their gated (users). Hence, serious considerations should be placed on opening up other base stations thereby creating a bridge for them to meet this users, users to have better access to them and they in turn can know their users' various claims.

5.5 Suggestion for Further Study

In the course of carrying out this research, a few other problems were brought to light. As such, the following research is suggested for further study; The perception of network users and factors for their behavioural patterns on Information Networks.

BIBLIOGRAPHY

Abendroth, D., & Killat, U. (2005). Effective bandwidth shaping: a framework for resource dimensioning extended version. Computer Communications, 1-8. Retrieved February 18, 2015, from http://www.sciencedirect.com/science/article/pii/S0140366404004074

Abidin, H. Z., Yusof, Y. M., & Suliman, I. S. (2014, December 11). Eprint. Retrieved from Digital repositories software and services: http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&uact=8&ved=0CC0QFjAC&url=http%3A%2F%2Feprints.uitm.edu.my%2F6735%2F1%2FLP_HUSNA%2520%2520ZAINOL%2520ABIDIN%252008_24.PDF&ei=QSeIVOn4DofnygOq_4II&usg=AFQjCNFtbg10cCqHnJGd1zCOe1uea7CQsw&

Adedokun, A. (2009). Bandwidth Management Using IP Traffic Analysis: Electrical Engineering. Ahmadu Bello University.

Aikenhead, G.S. (1997). Toward a First Nations cross-cultural science and technology curriculum. Science Education, 81, 217-238.

Akuezuilo, E.O. (1993). Research Methodology and Statistics: NUC/NBTE Minimum Standard Edition. Akwa: Nuel Cent (Nig.) Publishers.

Anjum B., Perros H. (2014). "Bandwidth estimation for video streaming under percentile delay, jitter, and packet loss rate constraints using traces", Computer Communications.

Anjum B., Perros H., Mountrouidou X., Kontovasilis, K., (2011). "Bandwidth allocation under end-to-end percentile delay bounds", International Journal of Network Management, Wiley, vol. 21, no. 6, pp. 536–547.Authentication Mechanisms," The Computer Journal (36:3).

Arenius, P. M. (2002). Creation of firm-level social capital, its exploitation, and the process of early internationalization. (Doctoral dissertation, Helsinki University of Technology, Espoo). Retrieved April 1, 2013, from http://www.tuta.hut.fi/units/Isib/research/bg/Arenius2002.pdf

Atkinson, R.L., Atkinson, R.C., Smith, E.E., & Bem D J., 1993, Introduction to Psychology. Harcourt Brace Jovanovich, Fort Worth, TX, 11th edition.

Bantz, C. R. (1990). "Organizational Communication, Media Industries and Mass Communication," In Communication Yearbook, J. Anderson (ed.) 13, Sage, Newbury Park, CA, pp. 133-141.

Barzilai-Nahon, K. (2004). Gatekeepers and Gatekeeping Mechanisms in Networks. Unpublished PhD dissertation, Tel-Aviv University, Tel-Aviv.

Barzilai-Nahon, K. (2007). Toward a theory of network gatekeeping: A framework for exploring information control. Journal of the America Society for Information Science and Technology.

Barzilai-Nahon, K. (2008). Gatekeeping: A Critical Review. Annual Review of Information Science and Technology.

Barzilai-Nahon, K. (2011). Fuzziness of Inclusion / Exclusion in Networks. International Journal of Communication, 5, 756–772.

Barron, B., & Darling-Hammond, L. (2008). Teaching for meaningful learning: A review of research on inquiry-based and cooperative learning. *Powerful Learning: What We Know about Teaching.*, 11–70. Retrieved from http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Teaching+for+meaningful+learning:+A+review+of+research+on+inquiry-based+and+cooperative+learning#0

Bastos, M. T., Raimundo, R. L. G., & Travitzki, R. (2013). Gatekeeping Twitter: message diffusion in political hashtags. Media, Culture & Society, 35(2), 260–270. http://doi.org/10.1177/0163443712467594

Best, J.W & Khan, J. V. (2007). Research in Education, 9th Edition. New Delhi: APH Publications.

Blaikie, N. (2000). Designing Social Research. London: Polity.

Blue Coat. (2009). Technical Brief: Bandwidth Management - Limiting Bandwidth. Sunnyvale, CA USA: Blue Coat Systems, Inc.

Brecht, H. D., & Ogilby, S. M. (2008). Enabling a comprehensive teaching strategy: Video lectures. Journal of Information Technology Education, 7, IIP 71- IIP 86.

Brown, J. S. (2006). 21st Century Learning Environments. *Partnership for 21st Century Skills*, 1–29. http://doi.org/10.1787/9789264006508-en

Bui, C. (2010). How online gatekeepers guard our view - news portals' inclusion and ranking of media and events. Global Media Journal, 9(16), 1–41.

Case, D. O. (2007). Looking for Information. In B. R. Boyce (Ed.), A survey of Research on Information Seeking, Needs and Behavior (Second Edition ed., p. 113). Burlington, USA: Elsevier Ltd.

Castells, M. (2011). A network theory of power. International Journal of Communication, 5, 773–787.

Choi, H. J., & Johnson, S. D. (2005). The effect of context-based video instruction on learning and motivation in online courses. The American Journal of Distance Education, 19(4), 215-227.

Choi, H. J., & Johnson, S. D. (2007). The effect of problem-based video instruction on learner satisfaction, comprehension and retention in college courses. British Journal of Educational Technology, 38(5), 885-895.

Cisco. (2013). Cisco WebEx network bandwidth. Retrieved from Web Conferencing and OnlineMeeting:http://www.cisco.com/c/en/us/products/collateral/conferencing/webex-meeting-center/white_paper_c11-691351.pdf

Cisco. (2014). Cisco Corp. Retrieved August 14, 2014, from Visual Networking Index: http://www.cisco.com/c/en/us/solutions/service-provider/visual-networking-index-vni/index.html

Coddington, M., & Holton, A. E. (2013). When the gates swing open: Examining network gatekeeping in a social media setting. Mass Communication and Society, (October), 130621104548001. http://doi.org/10.1080/15205436.2013.779717

Cohen, L. & Manion, L. (2000). Research Method for Education, 5th edition. London: Clive Bingley

Copyright Clearance Center. (2009). Video Use and Higher Education:Options for the Future. New York.

Creswell, J. W. (2003). Research design: Qualitative & quantitative approaches (2nd ed.). Thousand Oaks, CA: Sage.

Dede, C. (2005). Planning for Neomillennial Learning Styles. Educause Quarterly, 1, 7-12.

Deetz, S. (1996). Describing differences in approaches to organization science: Rethinking Burrell and Morgan and their legacy. Organization Science, 7, 191–207.

Deneen, L. (2002). Bandwidth Managenment Tools,Strategies, and Issues. Minnesota Duluth: University of Minnesota.

Denzin, N. K., & Lincoln, Y. S. (2003). The landscape of qualitative research: theories and Issues. Thousand Oaks, Calif., Sage.

Donohue, G.A., Tichenor, P.J., and Olien, C.N. (1972). "Gatekeeping: Mass Media Systems and Information Control," In Current Perspectives in Mass Communication Research, F. G. Kline and P. J. Tichenor (eds.), Sage, Beverly Hills, CA, pp. 41-70.

Denscombe, M. (2007). *The Good Research Guide small-scale social research projects* (3rd Edition). Open University Press McGraw-Hill.

Driscoll, M. P. (2000). Psychology of learning for instruction (2nd ed.). Needham Heights,MA: Allyn & Bacon.

Flickenger, R., Belcher, M., Canessa, E., & Zennaro, M. (Eds.). (2006). How to Accelerate Your Internet. Internet Network for the Availability of Scientific Publications, International Centre for Theoretical Physics

Fujimoto, R. (2014). Using Video in an Interactive Learning Program. Retrieved from Shoyu Learning Solutions: http://www.shoyu.com/research_using_video_interactive_learning_pro grams.asp

Gao, H., Knight, J. G., Yang, Z., & Ballantyne, D. (2014). Toward a gatekeeping perspective of insider-outsider relationship development in China. Journal of World Business, 49(3), 312–320. http://doi.org/10.1016/j.jwb.2013.06.002

Geleji G., Perros H. (2013). "Jitter analysis of an IPP tagged traffic stream in an {IPP, M}/M/1 queue", Annals of Telecommunications, vol. 69, nos. 5–6, pp. 283–294.

Gillham, B. (2000). Case Study Research Methods. London: Bill Gillham.

Goode, L. (2009). "Social news, citizen journalism and democracy". New Media & Society (2009), vol. 11(8): 1287–1305.

Hardy, M. & Bryman, A. (2004). Handbook of data analysis. London: Sage Publications.

Harorimana, D. (2012). The Gatekeeper and the knowledge environment- who they are, how they work Empirical evidences from High-tech Manufacturing and R & D Firms, (January).

Hartsell, T., & Yuen, S. C.-Y. (2006). Video streaming in online learning. AACE Journal, 14(1), 31-43. Retrieved from EdITLib Digital Library. (6152)

Hogan, A. J., & Lakey, D. J. (2012). Duration and Bandwidth Limiting. (J. Benedetto, Ed.) New york, London: Springer.

Homer, B., Plass, J., & Blake, L. (2008). The effects of video on cognitive load and social presence in multimedia-learning. Computers in Human Behavior, 24(3), 786-797.

Hoskins, A., & O'Loughlin, B. (2011). Remediating Jihad for Western news audiences: The renewal of gatekeeping? Journalism: Theory, Practice and Criticisms, 12(2), 199–216.

Ibrahim, M. F., Jamal, M., Yahya, S., & Taib, M. N. (2012). Available bandwidth estimation in network-aware applications for wireless campus e-learning system. Journal of Computer Networks and Communications, 2012. http://doi.org/10.1155/2012/380959

Joint Information Systems Committee. (2002). Video streaming: A guide for educational development. Manchester, UK: JISC Click and Go Video Project.

Kamin, C., O'Sullivan, P., Deterding, R., & Younger, M. (2003). A comparison of critical thinking in groups of third-year medical students in text, video, and virtual PBL case modalities. Academic Medicine, 78(2), 204-211.

Karanja, G. (2006). African Tertiary Institutions Connectivity Survey. International Development Research Centre.

Kenny, R., & Broughton, T. (2013). Domestic demand for bandwidth An approach to forecasting requirements for the period 2013-2023, (November). Retrieved from http://www.broadbanduk.org/wp-content/uploads/2013/11/BSG-Domestic-demand-for-bandwidth.pdf

Kim S and Varshney PK (2005) Adaptive online bandwidth allocation and reservation for QoS sensitive multimedia networks. Computer Communications. Volume 28, Issue 17, 17 Oct

Kim, S. (2014). Learning based bandwidth management algorithms by using bargaining and fictitious play approaches. Computer Networks, 73, 15–21. http://doi.org/10.1016/j.comnet.2014.08.001

Klass, B. (2003). Streaming media in higher education: Possibilities and pitfalls. Syllabus, 16(11).Retrieved September 4, 2014 from http://www.syllabus.com/article.asp?id =7769

Klass, B. (2005). Streaming media in higher education: Possibilities and pitfalls. Campus Technology (in print). Retrieved October 21, 2014, from http://www.campus-technology.com

Kuhn, T. S. (1962). The Structure of Scientific Revolutions (Vol. II)

Kuhn, Thomas (1977). The Essential Tension: Selected Studies in Scientific Tradition and Change. University of Chicago Press. pp. 320–39

Kurtz, G., & Sponder, B. (2010). SoTL in Online Education : Strategies and Practices for Using New Media for Teaching and Learning Online SoTL in Online Education : Strategies and Practices for Using New Media, 4(1).

Lawson, T., Bodle, J., Houlette, M., & Haubner, R. (2006). Guiding questions enhance student learning from educational videos. Teaching of Psychology, 33(1), 31-33.

Lewin, K. (1947). Frontiers in Group Dynamics: II. Channels of Group Life; Social Planning and Action Research. Human Relations, 1, 143-153.

Lewin, Kurt. (1951). Field Theory in Social Science: Selected Theoretical Papers. Ed. Dorwin Cartwright. New York: Harper.

Lincoln, Y. S and Guba E. G (1985) Naturalistic Inquiry. Newbury Park, C A: Sage Publication

Lockias, C. (2012). Bandwidth management in universities in Zimbabwe: Towards a responsible user base through effective policy Implementation. International Journal of Education and Development using Information and Communication Technology, 8(2), 62-76.

Maru, H. W. (2011). *Addis Ababa University Faculty of Informatics Department of Information Science Developing Dynamic Bandwidth Allocation Prototype Model for Campus Network Faculty of Informatics Department of Information Science*.

McKinsey & Company. (2011). The impact of Internet technologies : Search, (July), 58. Retrieved from http://www.mckinsey.com/insights/marketing_sales/measuring_the_value_of_search

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. *U.S. Department of of Education*, 94. http://doi.org/10.1016/j.chb.2005.10.002

Meraz, S., & Papacharissi, Z. (2013). Networked Gatekeeping and Networked Framing on #Egypt. The International Journal of Press/Politics, XX(X), 1-29. doi:10.1177/1940161212474472

Metzler, J. (2011). The changing role of the Network Administrator. *BMJ Careers*, 1–12. Retrieved from http://www.intralan.co.uk/documents/NARv3-2.pdf

Michelich, V. (2002). Streaming media to enhance teaching and improve learning. The Technology Source. Retrieved December 4, 2013 from http: //ts.mivu .org/default. asp?show= article&id=941

Montazemi, A. R. (2006). The effect of video presentation in a CBT environment. Educational Technology & Society, 9(4), 123-138.

Muranda, Z. (2004). Dissertation Writing: Concepts and Practice. Harare, Zimbabwe: University of Zimbabwe publications. P.20-59

Myers, M. D. (2009). Qualitative Research in Business & Management. London: Sage Publications.

Ndagi, J. O. (1999). The Essential of Research Methodology for Nigerian Educators. Ibadan;University Press PLC

Olsen, M. E., Lodwick, D. G., & Dunlap, R. E. (1992). Viewing the world ecologically. San Francisco: Westview Press.

Osuala, E.C. (1997). Introduction to Research Methodology. New Revised Edition. Onitsha:Africana-Feb Publishers LTD

Oswald, E. (2014). Hearst Newspapers, LLC. Retrieved from Small business: http://smallbusiness.chron.com/advantages-disadvantages-streaming-video-67979.html

Paly, T. (2012). Purposive Sampling Techniques. Simon Fraser University Pennsylvania: The Sage Press

Philip, L. J. (1998). Combining qualitative and quantitative approaches to social research in human geography: An impossible mixture? Environment and Planning, 30(2), 261-276.

Pisharody, A. (2013). The Future of Television: Will broadcast and cable television networks survive the emergence of online streaming? *NYU Stern*, (May), 55.

Poindexter, P., & McCombs, M. (2000). Research in mass communications: A practical guide. Boston: Bedford/St. Martin's.

Putnam, R (2000), Bowling Alone: The Collapse and Revival of American Community, A

Reeves, T.C., & Hedberg, J.G. (2003). Interactive learning systems evaluation. Englewood Cliffs, N.J.: Educational Technology Publications.

Scandura, T. A., & Williams, E. A. (2000). Research Methodology in Management: Current Practices, Trends, and Implications for Future Research. Academy of Management Journal, 43, 1248–64.

Shalangwa, A. D. (2014). Evaluation of bandwidth performance in a corporate network by using simulation model. Journal of Engineering and Technology Research, 6(1), 1-5.

Sharma, V., Thakur, B. S., & Vikram, K. (2011). Need of Bandwidth Management and Formulation of Policy Framework for Effective Utilisation of Internet Services Within a University Campus. International Journal of Computer Science and Communication, 2.

Shoemaker, P., (1991). Gatekeeping, Sage Publications, Newburry Park, CA.

Siemens, G., & Tittenberger, P. (2009). Handbook of Emerging Technologies for Learning. Image Rochester NY, 65. Retrieved from http://umanitoba.ca/learning_technologies/cetl/ HETL.pdf

Sondegard, P. (2005). The changing role of IT. *Gartner Symposium/IT Expo*.

Sulaiman, S. N. (2007). Fundamentals of research. Lagos: Sanbio-Nes Publishers Limited.

Suleiman, S. (2008). Researchers Companion: Key to Effective Research Writing. Kano: Samarib Press

TechTarget. (2015). What is bandwidth - Definition from WhatIs.pdf. Retrieved February 6, 2016, from http://searchenterprisewan.techtarget.com/definition/bandwidth

The Network. (2011). Ahmadu Bello University Chooses a Cisco Borderless Network Architecture to Create the Most Sophisticated Campus Network in Nigeria Retrieved December 15, 2015, from http://newsroom.cisco.com/press-release-content?articleId=571264

Wainwright , A. (2015). How to improve your school wireless network with WAN optimization. Retrieved June 01, 2015, from SecurEdge Networks: http://www.securedgenetworks.com/mobility-blog/How-to-improve-your-school-wireless-network-with-WAN-optimization

Weber, M. (1946), "Politics as a Vocation," In From Max Weber: Essays in Sociology, H. Gerth and C. Wright Mills (eds.), Oxford University Press, New York, 1946, pp. 77-128.

Wikipedia. (2010). Simple English Wikipedia, The Free Encyclopedia. Retrieved February 6, 2016, from https://simple.wikipedia.org/wiki/Bandwidth

Wouters, P., Tabbers, H. K., & Paas, F. (2007). Interactivity in video-based models. Educational Psychology Review, 19(3), 327-342.

Yang, S. Y. S., & Veciana, G. De. (2001). Bandwidth sharing: the role of user impatience. GLOBECOM'01. IEEE Global Telecommunications Conference (Cat. No.01CH37270), 4. http://doi.org/10.1109/GLOCOM.2001.966181

Yin, R. K. (2003). Case study research: Design and methods (3rd ed.). Thousand Oaks: Sage Publications.

Yin,R.K.(2009). Case Study Research: Design and Methods. London: SAGE Publication

Ying, L., & Basu, A. (2005). pcVOD: Internet Peer-to-Peer Video-On-Demand with Storage Caching on Peers. In DMS (pp. 218–223).

Zviran, M., and Haga, J. (1993). A Comparison of Password Techniques for Multilevel Authentication Mechanisms, The Computer Journal, vol. 36 no.3

APPENDIX I

DEPARTMENT OF LIBRARY AND INFORMATION SCIENCE,

AHMADU BELLO UNIVERSITY

Interview Guide

Topic: Exploring Perceptions of Network Managers on Bandwidth and Online Video Streams in Ahmadu Bello University, Zaria

Section A: Biodata Information

1. Briefly describe yourself taking into the account the following?

   Qualification, Various Certifications and Years of experience in the field

Section B: Ways Network Gatekeepers Perceive their Gatekeeping Role

2. What in your opinion are your paramount functions as network administrator?

Section C: Factors Considered in the Provision of Bandwidth

3. How much bandwidth is available to the University and what strategies do you employ to ensure that it remains optimum?
4. With the bandwidth available to you what factors do you consider in allocation of bandwidth to various users in the university?
5. Looking at these factors what percentage or amount of bandwidth do you allocate to students and various staff in the university?
6. Do you have any regular orientation programs or events on their usage of the internet and how it affects bandwidth?

Section D: Influence of Information Control and Gatekeeping Mechanisms on Accessing Online Video

7. Is traffic within the network prioritized? If Yes
8. What are the factors taken into consideration in prioritizing the network traffic?
9. In your opinion do network mechanisms have any effect on accessing videos online If No state reasons why you think so? …….
10. What mechanisms and measures are in place to facilitate and prioritize access to videos online? If No State why?
11. What measures and tools are in place or available on the network for improving the quality of the network for video packets?
12. What channels and routing rules are in place for to handle the load of video traffic on the network?
13. In your view are these tools and load balancing techniques performing efficiently?
14. Are you aware of any web caching functions or local video banks for videos within the network?