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GRID, CLOUD, AND BIG DATA: TECHNOLOGIES OVERLAPS

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Abstract

Computing world has witness tremendous development in recent time. First was the introduction of Grid Computing that enables enormous number of processing to be carried out easily. Secondly, Cloud Computing has become another buzzword after Web 2.0. However, there are dozens of different definitions for Cloud Computing and there seems to be no consensus on what a Cloud really is. Cloud Computing however, is not a completely new concept; it has intricate connection to Grid Computing paradigm, and other relevant technologies such as utility computing, cluster computing, and distributed systems in general. The new technology that has attracted serious attention among researchers in recent times is Big Data. Big data is the science of analyzing high volumes of diverse data in near-real time. This paper presents a comparative study of grid computing, cloud computing and big data technology. The specific objectives of the study are: (i) to investigate Grid Computing, Cloud Computing and Big Data technology; (ii) to analyze the relationship between Grid Computing and Cloud Computing, Grid Computing and Big Data, Cloud Computing and Big Data; and (iii) to determine the convergence between the three technologies. The findings from the study show that: (i) Grid Computing is a model of distributed computing that uses geographically and heterogeneous resources that are connected by high speed network; (ii) Cloud Computing is an economy and business driven paradigm, with an excellent model of resource sharing; (iii) Big Data is more than growing sizes of dataset, but rather the complexity that such a growth generates with regard to different aspects of data handling; and (iv) both Grid and Cloud Computing provides robust and flexible platform for big data analysis.

Keyword: Grid Computing, Cloud Computing, Big data, Distributed Computing

Introduction

In the 1990s, the term Grid Computing pervades the whole computing world, taking it like wildfire, then in the mid-2000s Cloud Computing became the new marketing strategy adopted by most company and recently Big Data is the new buzz word trending the world of computer and beyond. These rapidly evolving computing paradigms essentially bring about confusion to the mind of new and even experienced professionals as to what is needed by an individual or an organization. What advantages and disadvantages there are, that these technologies have to offer? The aim of this paper is to carry out a comparative study of Grid Computing, Cloud Computing and Big Data. The specific objectives of the study are to: (i) investigate Grid Computing, Cloud Computing and Big Data; (ii) analyze the relationship between Grid Computing and Cloud Computing, Grid Computing and Big Data, Cloud Computing and Big Data; and (iii) determine the convergence between the three technologies. The rest part of the paper is organized as follows: Section 2 discussed the related study. Section 3 presented

a brief description of the three technologies; while section 4 presented the results of a comparative study of the three technologies.

Related Work

It is worth mentioning that Cloud Computing overlaps with many existing technologies, such as Grid Computing, Utility Computing, Services Computing, and distributed computing in general. Cloud Computing not only overlaps with Grid Computing, it indeed evolved out of Grid Computing and relies on Grid Computing as its backbone and infrastructure support. The evolution has been a result of a shift in focus from an infrastructure that delivers storage and compute resources (such is the case in Grids) to one that is economy based aiming to deliver more abstract resources and services (such is the case in Clouds).

In spite of grid computing being beneficial in many ways, current grid infrastructure cannot support big data, experts are yet to find a precise solution for the database to deal with large volumes of data. Although grid computing provides technology to overcome the hardware limitation in term of storage space, processing power and memory capacity, implementation of big data processing and management using grid computing requires additional techniques for managing the huge data effectively (Ku Ruhana et al, 2013).

Big data clustering using grid computing and ant based algorithm was proposed by (Ku Ruhana et al, 2013) the framework uses the grid concept to facilitate the storage of data in distributed databases across a wide geographical area while ant-based algorithm is for the clustering of big data. The algorithm's basic principle focuses on agents where the agents represent the ants that randomly move around in their environment which is a squared grid with periodic boundary conditions. While ants drifting around in their environment, they pick up the data item that are either isolated or surrounded by different ones. The selected item will be transported and dropped by ants to form a group with a similar neighborhood items base on similarity and density of data items. The probability of picking an element increases with low density and decreases with the similarity of the element. The idea behind this type of aggregation pheromone is the attraction between data items and artificial ants. Small clusters of data items grow by attracting ants to deposit more items. Therefore, this positive feedback leads to the accumulation of larger clusters.

Distributed caching was proposed by Chandhini C et al (2013) to solve the challenge of big data. It provides linear scalability through data grid partitioning. The data is spread out over all servers in such a way that no two servers are responsible for the same piece of cached data. This means that the size of the cache and the processing power associated with the management of the cache can grow linearly with the size of the cluster. When there is a request for cached data, the response can be accomplished with

a “single hop” to another server, if the data object is not found in local cache. This means when more servers are added to the grid, the performance of the response does not decrease. The grid allows a number of backups for the caches to be configured, when the primary cache fails, one of the backups will takeover, this provides the failover for clustering technologies. A Dynamic and Scalable Storage Management (DSSM) architecture for big data management in grid environments was proposed by Ajay Kumar and Seema Bawa. It organizes Grid storage devices into a large scale and geographically distributed storage system to meet the requirements imposed by all kinds of Grid applications. The DSSM divides Grid storage devices into multiple geographically distributed domains to facilitate the data access locality (Yuhui et al, 2008). The architecture consists of two levels. The bottom level adopts multicast to achieve dynamic, scalable, and self-organized physical domains. The method significantly simplifies the intra-domain storage resource management. The upper level is a virtual domain that consists of geographically distributed and dynamic agents selected from each physical domain.

A Cloud infrastructure can be utilized internally by a company or exposed to the public as utility computing. Figure 1 show an overview of the relationship between Clouds and other domains that it overlaps with. Web 2.0 covers almost the whole spectrum of service-oriented applications, where Cloud Computing lies at the large-scale side. Supercomputing and Cluster Computing have been more focused on traditional non-service applications. Grid Computing overlaps with all these fields where it is generally considered of lesser scale than supercomputers and Clouds.

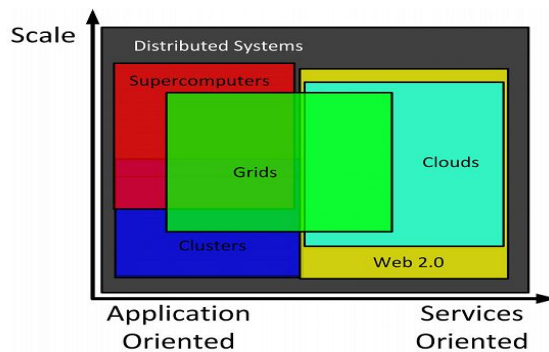


Figure 1: Grids and Clouds Overview

(source: “What is the grid? a three-point checklist” Lan Foster. 2002)

Half a decade ago, Ian Foster gave a three-point checklist to help define what is, and what is not a *Grid*: (1) coordinates resources that are not subject to centralized control, (2) uses standard, open, general-purpose protocols and interfaces, and (3) delivers non-trivial qualities of service. Although point 3 holds true for Cloud Computing, neither point 1 nor point 2 is clear that it is the case for today's Clouds. The vision for Clouds and Grids are similar, details and technologies used may differ, but the two communities are struggling with many of the same issues.

Data size has increased significantly with the advent of today's technology in many sectors such as manufacturing, business, science and web application. Some data are structured, semi structured while others are unstructured and mix with varied types of data such as documents, records, pictures and videos. The size and structure of such data have become extremely dynamic. Application developers are faced with challenges caused by the surge of this data from different sources which are short of structure and schema. The existing technologies such as grid and cloud computing have access to huge amounts of computing power by summing of resources and offering a single system view. These technologies have become an influential architecture that performs large-scale and complex computing, and have revolutionized the way that computing infrastructure is abstracted and used. In addition, an important aim of these technologies is to convey computing as an answer for solving big data issues, such as large scale, multi-media and high dimensional data sets (Chan going et al. 2012).

BRIEF DESCRIPTION OF THE THREE TERMINOLOGIES

Grid-Computing

Grid computing is a model of distributed computing that uses geographically and administratively different resources. In grid computing individual users can use computers and data transparently, devoid of having to think of location, operating system, account administration and other details. In grid computing the details are abstracted and the resources are virtualized (Chandhini, Megana, 2013) Grid computing is represented by a number of servers that are interconnected by a high speed network, each of the server plays one or many roles. The two main benefits of Grid computing are the high storage capability and the processing power, which translates to the two main types of grids.

Data-Grid

Data grids provide an infrastructure to support data storage, data discovery, data handling, data publication, and data manipulation of large volumes of data actually stored in various heterogeneous databases and file systems. It can also be defined as a system composed of multiple servers that work together to manage information and related operations such as computations in a distributed environment. An In-memory to

attain very high performance, and uses redundancy to make sure the resiliency of the system and the availability of the data in the event of server failure (Chandhini, Megana, 2013).

Computational Grid

A computational grid is a hardware and software infrastructure that provides reliable, consistent, pervasive and inexpensive access to high-end computational capabilities. This grid provides protected access to huge pool of shared processing power appropriate for high throughput applications. The computational grids offer a convenient way to connect many devices which helps in reducing the power consumed and also increases the speed of the systems. Computational grids are used by many organizations example health maintenance, material science collaboratory, computational market economy, government etc Chandhini, Megana, 2013).

Cloud Computing

Cloud Computing is the on-demand delivery of IT resources via the Internet with Pay-As-You-Go pricing. As a newly emerged computing paradigm, several attempts to define Cloud Computing were introduced. Buyya et al, 2009 define a cloud as “a type of parallel and distributed system consisting of a collection of inter-connected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resource(s) based on service-level agreements established through negotiation between the service provider and consumers. In this context, Cloud Computing is an economy -and business- driven paradigm. The cloud provider and the customers establish an SLA (Service Level Agreement) contract that formally defines the service delivered. The customers can specify their needs in terms of resources, performance, availability, etc., and pay only for what they consume. In addition to its flexible and fair pricing models, the Cloud Paradigm promises highly desired features and advantages. The main two features are on-demand resources delivery and elasticity. Customers can easily purchase new resources from the cloud provider in real time and scale up horizontally, and simply free leased resources later according to their requirements and peak computation times. Furthermore, leasing resources from cloud providers with high-level expertise on how to manage infrastructures and platforms, guarantees high rates of reliability and availability. Cloud Computing presents an excellent model of resource sharing as well. The computing resources delivered over Internet are, usually, running on virtual machines running side by side on the same physical infrastructure. In this context, advances in networking and virtualization technologies enabled applications and services to share infrastructure resources efficiently.

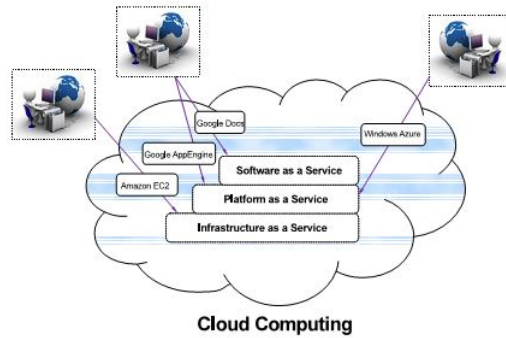


Figure 2: Abstraction layers of Cloud Services

Cloud Service Levels

Cloud Computing services differ in their levels and can be classified into three layers as shown on Figure 2. Cloud clients nowadays can purchase resources of different natures from various providers. A client can lease infrastructure resources, platform resources, or software resources, possibly all three types simultaneously.

Infrastructure as a Service (IaaS)

In this type of service, clients outsource the infrastructure and the equipment necessary for their platform and application deployments. Clients can just rent on-demand the virtual machines (VMs), and the storage resources they need. The cloud provider hosts, manages, and maintains pools of infrastructure equipment including storage, computing servers, networking, and other hardware components. The task of managing and maintaining the software stack is left to the clients. The typical pricing models for such services are Pay-As-You-Go based. Examples of this type of service include Amazon Elastic Cloud Compute (Amazon EC2 2013) and HP Cloud

Platform as a Service (PaaS)

This type of service includes providing a computing platform, in addition to the implicit infrastructure that hosts the platform resources. Users rely on the provided platform to create and/or run their applications. PaaS has been gaining a major popularity in recent years. Clients export the platform and infrastructures management, with all its complexity, to a third party that is, generally, better experienced, and better equipped to deal with the related platform and infrastructure challenges. For instance, any client can deploy Hadoop Map Reduce applications in a few mouse clicks over Amazon Elastic Map Reduce service.

Software as a Service (SaaS)

Software as a service is the highest level in the abstraction of service layers. The software services are hosted on the infrastructure of the cloud provider in this model, and are delivered over a network, Internet typically. With the evolution of the network hardware and the high bandwidth recently achieved, it is possible for clients to run applications and software over the Internet that were traditionally run in local computers. Such a type of service is beneficial to client organizations as it facilitates the administration of applications, allows better homogeneity of versions between application users, and more importantly provides global accesses and collaborations.

Big Data Technology

Big Data is more than growing sizes of datasets, but rather the complexity that such a growth generates with regard to different aspects of data handling. Stonebraker (2013) introduces Big Data according to the "3Vs" model. Big Data refers to datasets that are of a big volume, need big velocity, or exhibit big variety.

Big Volume

Nowadays, data sizes are exponentially increasing. Multiple companies and organizations are experiencing Data Deluge phenomenon due to multiple factors such as stored data collected over the years, data streaming and sharing over social media, increasing sensors collected data, etc. Stonebraker (2013) considers the Big Volume property as important and challenging for two types of analytics: "small analytics" and "big analytics". Small analytics include smaller operations such as running SQL analytics (count, sum, max, min, and avg), while big analytics are more complex operations that can be very expensive on very large datasets, such as clustering, regressions, and machine learning.

Big Velocity

For many organizations, the most challenging aspect of Big Data is not exclusively the large volume. It is rather, how fast to process data to meet demands. A wide range of applications require fast data processing in near real-time manner, no matter how overwhelming the size of data. For instance, electronic trading, RFID tags and smart metering, ad placement on Web pages, fit in this class of applications.

Big Variety

Data comes in various formats: from text data to video and audio, from traditional DBMS (Database Management Systems) formats to semi-structured data (*e.g.* XML), to large binary objects. The primary challenge is to integrate all these types of data, and manage them in an efficient way. SAS estimates that 80% of organization data are not numerical. Nevertheless, those data should be included in analytics and decision-making. In addition to the aforementioned three dimensions of Big Data in the form of

volume, velocity and variety, SAS defines two complementary dimensions which are variability and:

Big Variability

In addition to velocity and variety, data may exhibit Big Variability in the form of inconsistent or non-regular data flows with periodic peaks. In particular, this is a typical behavior for applications such as social media that might suddenly experience high loads during trending news or with seasonal events. In this context, Big Data variability might be particularly challenging to manage, for instance when social media is involved.

Big Complexity

Managing huge volumes of data that come from multiples sources and systems is most of the times difficult. Management aspects can be particularly challenging for linking, matching, cleansing and transforming data across systems and platforms.

Big Data Platforms

Traditional storage systems such as DBMS and data querying models fail to meet Big Data requirements. In order to address this issue, multiple storage solutions and data processing models were introduced.

Big Data Infrastructures

The phenomenal growth of Big Data requires efficient infrastructures and novel computing paradigms in order to meet the huge volumes of data and their big velocity. The three common infrastructure models that have the potential to offer excellent means to manage Big Data are Cluster computing, Grid Computing, and Cloud Computing.

COMPARISON OF THE GRID, CLOUD AND BIG DATA TECHNOLOGY

The Grid, Cloud and Big Data can be shown to be related as shown in Figure 2, because Grid Computing, Cloud Computing and Cluster Computing are the three common infrastructure models that have the potential to offer excellent means to manage Big Data.

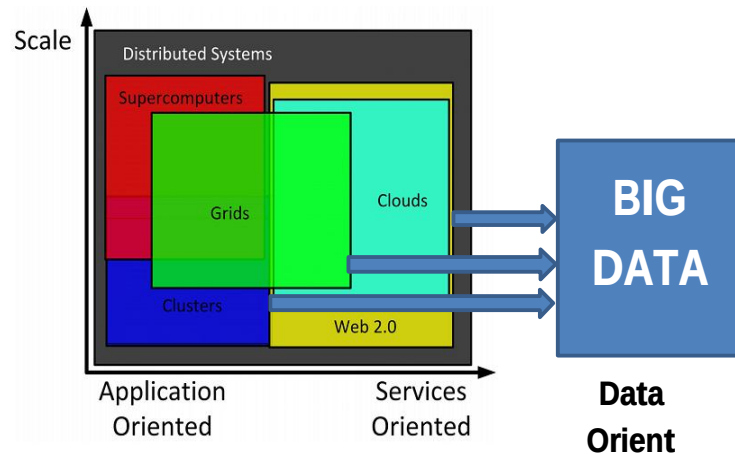


Figure 2: Grids, Clouds, and Big Data Comparison

As cloud computing represents advancement from grid computing, there are naturally a number of similarities:

- (i) **Scalability**– Scalability refers to the system’s ability to handle increasing amounts of work, or to improve performance. Both grid and cloud computing are scalable, as application instances are load balanced. CPU and network bandwidth is directed on demand. This means that grid and cloud systems have a storage capacity that fluctuates, depending on the number of users, instances and the amount of data transferred at a specific time;
- (ii) **Multi-tenancy and Multitasking** –Multitenancy refers to a situation in which a single instance of software is able to serve multiple clients (tenants). Multitasking refers to when multiple tasks (processes) share processing resources. Multitenancy and multitasking, common to both grid and cloud computing, allow numerous users to perform different tasks and access single or multiple application instances.

COMPARISON OF THE BENEFIT OF GRID, CLOUD AND BIG DATA

The discussion in Table I list the benefits associated with each of the three technologies.

Table 1: Benefit of Grid, Cloud and Big Data

GRID	CLOUD	BIG DATA
Enables applications to be easily scaled	Increased Scalability	Cost reduction
Better utilization of underused resources	Flexibility	Faster, better decision making
Enables the linking of cheaper computers together, instead of spending a lot of money on one machine	Disaster recovery	Easy to create new products and services
Technologies being used are open source, trust and transparency is encouraged	Metered Service	It makes Dialogue with consumers easy.
Increased reliability of computing	Increased collaboration	Perform risk analysis
Allows the sharing of computer resources across networks	Faster Deployment	Keeping your data safe
Parallelization of processing	Resource Pooling	Help to create new revenue streams
Resource balancing	Automatic software updates	Reducing maintenance costs
	Inherited Resiliency	Offering enterprise-wide insights
	Highly Automated	

ADVANTAGES AND DISADVANTAGES OF GRID

Table 2 summarizes the advantages and disadvantages of Grid technology.

Table 2: Advantages and Disadvantages of using Grid Computing

Advantages	Disadvantages
Can solve larger, more complex problems in a shorter time	Grid software and standards are still evolving
Reliability	High Internet Connections Required
Easier to collaborate with other organizations	Non-interactive job submission
Resource Balancing	Not Stable;
Access to Additional Resources	Different Administrator Domain
Make better use of existing hardware	Learning curve to get started
Computers working Together	Technology support to utilize the grid
Unused computing capacity is effectively used	Some applications cannot be parallelized

ADVANTAGES AND DISADVANTAGES OF CLOUD

Table 3 display the advantages and disadvantages of Cloud

Table 3 itemize the advantages and disadvantages associated with using Cloud Computing

Advantages	Disadvantages
Shared Resources	Internet Required
Automatic Software Integration	Dependency and vendor lock-in
Cost Efficient	Non-Interoperability
Easy Access to Information	Less Reliability
Quick Deployment	Technical Issues
Almost Unlimited Storage	Security in the Cloud
Backup and Recovery	Prone to Attack
Better Hardware Management	Increased Vulnerability
Mobility	Less Control
Versatile Compatibility	No always many room

ADVANTAGES AND DISADVANTAGES OF BIG DATA

Table 4 presents a summary of the advantages and disadvantages of Big Data technology.

Table 4 Advantages and disadvantages of Big Data

Advantages	Disadvantages
Errors within the organization are known instantly	It requires special computer power
New strategies of your competition are noticed immediately	Big Data often have big noise, i.e. there may be many meaningless data points. The analyst should work hard to separate the wheat from the tares
Fraud can be detected the moment it happens and proper measures can be taken to limit the damage.	Big Data often implies privacy problems, which can be seen, for instance, from the analysis of social networks
Cost savings	Big data also means quite a low security level. It is natural as Clouds are always not as secure as on-site data warehouses.
Better sales insights, which could lead to additional revenue	It mandates major strategic changes for many businesses.
<i>Keep up with customer trends</i>	

COMPARISON BETWEEN GRID AND CLOUD COMPUTING

Table 5 presents a comparison between Grid and Cloud Computing technologies

Table 5 Comparing the Grid Computing with Cloud Computing.

Grid Computing	Cloud Computing
Resources are pre-reserved	Resources are on-demand
Not rapid elasticity	Rapid elasticity
Distributed computing architecture	Client-server architecture
Used for specific purposes	Used for business and public needs
Grids evolve slower than cloud	Clouds evolve faster than grid
Level of expertise to use a grid is higher than cloud.	Level of expertise to use a cloud is lower than grid.
It is the base concept of cloud computing	Cloud offers more services than grid computing
A grid is not necessarily a cloud or part of a cloud	A cloud would usually use a grid
Grids tends to be more loosely coupled, heterogeneous, and geographically dispersed compared to conventional cluster computing systems	In-fact almost all the services on the Internet can be obtained from cloud, e.g. web hosting, multiple OS, DB support and much more.
Grid computing federates resources located within different organizations	Cloud computing is typically provided within a single organization (Amazon), that

	simplifies many aspects, particularly security, availability and heterogeneity
Failure management (Self-healing) is limited (often failed tasks/applications are restarted)	Strong support for failover and content replication. VMs can be easily migrated from one node to other.
Resource management is distributed	Resource management is centralized/distributed

COMPARISON BETWEEN GRID AND BIG DATA

Table 6: presents Comparison between Grid and Big Data technologies.

Table 6 gives the comparison between Grid Computing and Big Data

Grid Computing	Big Data
Works well for predominantly compute intensive jobs, but it becomes a problem when nodes need to access larger data volumes (hundreds of gigabytes), since the network bandwidth is the bottleneck and compute nodes become idle.	Tries to co-locate the data with the compute nodes, so data access is fast because it is local. This feature, known as data locality (heart of Hadoop).
Data flow is exposed by low level programming.	Data flow is exposed by high level programming.
Explicitly manage their own check pointing and recovery of tasks.	Managed by Map Reduce processing engine.
Grid Computing resources are highly expensive.	Big Data not as expensive as Grid.
Grids evolve slower than big data	Big Data evolve faster than grid
Grid is mostly used in the Academic environment.	Mostly used in the business environment.

COMPARISON BETWEEN CLOUD AND BIG DATA

Table 7 presents a comparison between Cloud and Big Data

Table 7 gives the comparison between Cloud Computing and Big Data

Cloud Computing	Big Data
Cloud Computing is the on-demand delivery of IT resources via the Internet with Pay-As-You-Go pricing.	Makes use of the Cloud Computing infrastructure.
Cloud Computing is an economy and business- driven paradigm	Reduce cost of analysis.
It is very flexible	It is becoming flexible as well
Cannot deal with more complex situation	Can deal with more complex situations
Provides an enable environment for faster processing of information.	Leverage the cloud for fast processing of data.

Summary and Conclusion

This paper presents a comparative study of Grid Computing, Cloud Computing and Big Data. The specific objectives of the study were to: (i) investigate Grid Computing, Cloud Computing and Big Data technologies; (ii) analyze the relationship between Grid Computing and Cloud Computing, Grid Computing and Big Data, Cloud Computing and Big Data; and (iii) determine the convergence between the three technologies

The findings from the study show that Grid Computing is a model of distributed computing that uses geographically and heterogeneous resources that are connected by high speed network. Cloud Computing is an economy and business driven paradigm, with an excellent model of resource sharing. Big Data is more than growing sizes of dataset, but rather the complexity that such a growth generates with regard to different aspects of data handling. Big data refers to datasets that are of a big volume, need big velocity, or exhibit big variety. The Knowledge gained from the study of the three technologies in computer domain is not only very important to guide users in what platform to use in order to tackle the barrage of problems facing humans, but will erase the existing confusion between the three technologies and reduce the time to make decision by individual or organization.

In Conclusion, both Grid and Cloud Computing provides robust and flexible platform for big data analysis. However, there is the needed to determine the best possible infrastructure that will bring the best of big data analytic to the end users, and the possibilities of combining the different infrastructure platform for effectiveness and cost reduction.

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SIMPLE PENDULUM EXPERIMENTAL BASED SYSTEM WITH DIFFERENT MASSES OF BOBS

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Abstract

In simple experiment that involves simple pendulum of different masses, there is always concern about the mass of gravitational force values due to different in masses of the bob. The objective of this study is to compare different oscillations of pendulum with different masses in order to determine their momentums and their gravitational force due to changes in mass of bob. The visual representations will be presented with MATrix LABORatory (Matlab) to represent their momentums and periods in graphical forms. With the graphical representation, their differences in oscillations can easily be shown and represented. This visual representation will assist to predict the pattern of oscillation of different pendulums when it involves different masses, which shows the finding that the higher the mass of the bob of the oscillating pendulum the higher the acceleration due to gravity which also implies that the mass of the bob determines the value to be generated. And when compare two pendulums which have different masses, each oscillations will be recorded.

Keyword: Pendulum, momentum, oscillations, bob.

Introduction

Visualization according to Turfle (2001) is the systematic and visual display of information in the form of tables, diagrams and graphs. Reisberg (1997) and Kossly (1994) were concerned with representative and process of information by the brain in their definitions. Reisberg (1997) for example tried to distinguish between Visual perceptions as meaning the image, an object achieved and as it can be seen as visual imagery, the mental production of an object in its absence and spatial imagery as represented by tactile meaning. Kosslyn (1994) link brain activities by the uses of phrase “mental imagery” instead of visual imagery.

Johnson, (1985) also described visualization as internal mental construct or mental models, thought to be in the mind and used in mental imagery and for solving problems.

Webster (1997) described visualization as the act or process of interpreting in visual terms or putting into visual form.

The classical definition of visualization is described as the formation of mental visual images, the act or process of interpreting in visual term or of putting into visual form a more recent definition of computer visualization is described as a tool or method for interpreting image data given to a computer and for generating images from computer multi-dimensional data sets (Domink, 2007).

There are different types of visualizations but scientific visualization is our main focus in this study, (Brodlike, Earnshaw and Wiseman, 1992) believe that the whole techniques of scientific visualization are concerned with exploring data and information in such a way as to gain a deeper level of understanding and insight into the data. Visualization techniques have been used to analyse and display large volume of multidimensional data in manners as to allow the users to extract useful information quickly and easily.

A pendulum is a weight suspended from a pivot so that it can swing freely (Michael, Colin & Arthur; 2005). When a pendulum is displaced sideways from its resting, equilibrium position, it is subject to a restoring force due to gravity that will accelerate it back toward the equilibrium position. When released, the restoring force combined with the pendulum's mass causes it to oscillate about the equilibrium position, swinging back and forth. The time for one complete cycle, a left swing and a right swing, is called the period. The period depends on the length of the pendulum, and also to a slight degree on the amplitude, the width of the pendulum's swing.

A simple pendulum consists of a mass m hanging from a string of length L and fixed at a pivot point P . When displaced to an initial angle and released, the pendulum will swing back and forth with periodic motion. With the assumption of small angles, the frequency and period of the pendulum are independent of the initial angular displacement amplitude. All simple pendulums should have the same period regardless of their initial angle (and regardless of their masses). The period for a simple pendulum does not depend on the mass or the initial angular displacement, but depends only on the length L of the string and the value of the gravitational field force (g).

$$T = 2\pi\sqrt{\frac{L}{g}} \quad \text{eqn....(i)}$$

When the angular displacement amplitude of the pendulum is large enough that the small angle approximation no longer holds, then the equation of motion must remain in its nonlinear form

$$\frac{d^2\theta}{dt^2} + \frac{g}{L}\sin\theta = 0 \quad \text{eqn.... (ii)}$$

The small angle approximation is valid for initial angular displacements of about 20° or less. The pendulum assumes the linear small angle approximation of simple harmonic motion. When the initial angular displacement is significantly large that the small angle approximation is no longer valid, the error between the simple harmonic solution and the actual solution becomes apparent almost immediately, and grows as time progresses.

The simple pendulum is a system consisting of a string of length L , which is assumed to be mass less and stretchable, and a particle of mass attached to the string called the pendulum bob. When the mass is displaced a small angle from equilibrium and then released, the pendulum will undergo simple harmonic motion.

A simple pendulum consists of a mass m hanging at the end of a string of length L . The period of a pendulum or any oscillatory motion is the time required for one complete cycle, that is, the time to go back and forth once. If the amplitude of motion of the swinging pendulum is small, then the pendulum behaves approximately as a simple harmonic oscillator, and the period of the pendulum is given approximately by where g is the acceleration of gravity. This expression for T becomes exact in the limit of zero amplitude motion and is less and less accurate as the amplitude of the motion becomes larger. From this expression, we can use measurements of T and L to compute g .

Momentum is very important when we talk about the forces that normally associated with the oscillating pendulum. This study will try and relate momentum change to time during the oscillation of pendulum. Momentum can simply be described as the quantity of motion of a moving body, measured as a product of its mass and velocity.

Review of related work

This paper will not be complete without review some past work on simple pendulum. Morton and Charlton, Lewis (2005), reviewed that pendulum and Its function was to sway and activate one of a series of levers after being disturbed by the tremor of an earthquake far away. Released by a lever, a small ball would fall out of the urn-shaped device into one of eight metal toad's mouths below, at the eight points of the compass, signifying the direction the earthquake was located.

Galileo (1602) discovered the crucial property that makes pendulums useful as timekeepers, called isochronism; the period of the pendulum is approximately independent of the amplitude or width of the swing. He also found that the period is independent of the mass of the bob, and proportional to the square root of the length of the pendulum. He first employed free swinging pendulums in simple timing applications. His physician friend, Santorio Santorii, invented a device which measured a patient's pulse by the length of a pendulum; the pulsilogium (Drake, 2003). Galileo conceived and dictated to his son Vincenzo a design for a pendulum clock; (Van Helden, Albert 1995) Vincenzo began the construction of pendulum clock, but had not completed it

when he died in 1649 (Van Helden, Albert 1995). The pendulum was the first harmonic oscillator used by man.

Christian Huygens built the first pendulum clock in 1656. This was a great improvement over existing mechanical clocks; the best accuracy was increased from around 15 minutes deviation a day to around 15 seconds a day. Eidson, (2006) pendulums spread over Europe as existing clocks were retrofitted with them.

Robert Hooke studied the conical pendulum around 1666, consisting of a pendulum that is free to swing in two dimensions, with the bob rotating in a circle or ellipse. He used the motions of this device as a model to analyze the orbital motions of the planets (Nauenberg, 2006). Hooke suggested to Isaac Newton in 1679 that the components of orbital motion consisted of inertial motion along a tangent direction plus an attractive motion in the radial direction. This played a part in Newton's formulation of the law of universal gravitation. Robert Hooke was also responsible for suggesting as early as 1666 that the pendulum could be used to measure the force of gravity (Nauenberg, 2006).

During his expedition to Cayenne, French Guiana in 1671, Jean Richer found that a pendulum clock was 2 ½ minutes per day slower at Cayenne than at Paris. From this he deduced that the force of gravity was lower at Cayenne.

Isaac Newton in Principia Mathematical showed that this was because the Earth was not a true sphere but slightly oblate (flattened at the poles) from the effect of centrifugal force due to its rotation, causing gravity to increase with latitude. Portable pendulums began to be taken on voyages to distant lands, as precision gravimeters to measure the acceleration of gravity at different points on Earth, eventually resulting in accurate models of the shape of the Earth.

Marin Mersenne and René Descartes discovered around 1636 that the pendulum was not quite isochronous; its period increased somewhat with its amplitude. (Matthews, 1994) Huygens analyzed this problem by determining what curve an object must follow to descend by gravity to the same point in the same time interval, regardless of starting point; the so-called tautochrone curve. By a complicated method that was an early use of calculus, he showed this curve was a cycloid, rather than the circular arc of a pendulum, (Mahoney, 2007) confirming that the pendulum was not isochronous and Galileo's observation of isochronism was accurate only for small swings. Bevilaqua (2005) Huygens also solved the problem of how to calculate the period of an arbitrarily shaped pendulum (called a compound pendulum), discovering the center of oscillation, and its interchangeability with the pivot point (Headrick, 2002)

The existing clock movement, the verge escapement, made pendulums swing in very wide arcs of about 100° (Headrick, 2002). Huygens showed this was a source of inaccuracy, causing the period to vary with amplitude changes caused by small unavoidable variations in the clock's drive force. To make its period isochronous, Huygens mounted cycloidal-shaped metal 'chops' next to the pivots in his clocks, that constrained the suspension cord and forced the pendulum to follow a cycloid arc (Andrewes, 1994). This solution didn't prove as practical as simply limiting the pendulum's swing to small angles of a few degrees. The realization that only small swings were isochronous motivated the development of the anchor escapement around 1670, which reduced the pendulum swing in clocks to 4° – 6° (Headrick, 2002). The pendulum clock's role as the most accurate timekeeper motivated much practical research into improving pendulums. It was found that a major source of error was that the pendulum rod expanded and contracted with changes in ambient temperature, changing the period of swing. This was solved with the invention of temperature compensated pendulums, the mercury pendulum in 1721 and the gridiron pendulum in 1726, reducing errors in precision pendulum clocks to a few seconds per week (Andrewes, 1994).

The accuracy of gravity measurements made with pendulums was limited by the difficulty of finding the location of their center of oscillation. Huygens had discovered in 1673 that a pendulum has the same period when hung from its center of oscillation as when hung from its pivot, and the distance between the two points was equal to the length of a simple gravity pendulum of the same period. Henry Kater the British Captain invented the reversible Kater's pendulum (Kater, 1818) which used this principle, making possible very accurate measurements of gravity. For the next century the reversible pendulum was the standard method of measuring absolute gravitational acceleration.

The effect of the surrounding air on a moving pendulum is complex and requires fluid mechanics to calculate precisely, but for most purposes its influence on the period can be accounted for by three effects:

- By Archimedes' principle the effective weight of the bob is reduced by the buoyancy of the air it displaces, while the mass (inertia) remains the same, reducing the pendulum's acceleration during its swing and increasing the period. This depends on the air pressure and the density of the pendulum, but not its shape.
- The pendulum carries an amount of air with it as it swings, and the mass of this air increases the inertia of the pendulum, again reducing the acceleration and increasing the period. This depends on both its density and shape.
- Viscous air resistance slows the pendulum's velocity. This has a negligible effect on the period, but dissipates energy, reducing the amplitude. This reduces the

pendulum's Q factor, requiring a stronger drive force from the clock's mechanism to keep it moving, which causes increased disturbance to the period.

Increases in barometric pressure increase a pendulum's period slightly due to the first two effects, by about 0.11 seconds per day per kilopascal (0.37 seconds per day per inch of mercury or 0.015 seconds per day per ton). Researchers using pendulums bob to measure the acceleration of gravity which had to correct the period for the air pressure at the altitude of measurement, computing the equivalent period of a pendulum bob swinging in vacuum. A pendulum clock was first operated in a constant-pressure tank by Friedrich Tiede in 1865 at the Berlin Observatory, and by 1900 the highest precision clocks were mounted in tanks that were kept at a constant pressure to eliminate changes in atmospheric pressure. In some, a small aneroid barometer mechanism attached to the pendulum compensated for this effect.

The major disadvantages of this past related work, is that they did not consider the weight of ball which has effect on the period and the gravitational force. Pendulums are affected by changes in gravitational acceleration, which varies by as much as 0.5% at different locations on Earth, so pendulum clocks have to be recalibrated after a move. Even moving a pendulum clock to the top of a tall building can cause it to lose measurable time from the reduction in gravity.

Material and Method

The data given below were used to determine different pendulum of different masses and their graphical representation.

The radius of oscillation or equivalent length L of any physical pendulum can be shown to be

$$L = \frac{I}{mR} \quad \text{eqn. (iii)}$$

Where I is the moment of initial of the pendulum, while m is the mass of the pendulum, and R is the distance between the point and the center of mass. Substituting this expression in (1) above, the period T of a compound pendulum is given by

$$T = 2\pi \sqrt{\frac{I}{mgR}} \quad \text{eqn.(iv) for sufficiently small oscillations.}$$

Table 1: The experimental result for Pendulum of bob mass of 8.32g

L (cm)	L (cm)	t ₁ (s)	t ₂ (s)	t (s)
100.0	1.0	38.0	38.1	38.05
80.0	0.8	34.0	34.0	34.00
60.0	0.6	30.0	29.0	29.50
40.0	0.4	24.1	24.0	24.05
20.0	0.2	17.1	17.5	17.30

From the table 1 above, display the experimental result of pendulum with bob mass of is8.32g, at 100 to 20 cm to generate time (t₁, t₂ and t₃) in seconds in order to calculate the momentum and acceleration of the pendulum bob.

Table 2: The experimental result for Pendulum of bob mass of 268.42g

L (cm)	L (cm)	t ₁ (s)	t ₂ (s)	t (s)
100.0	1.0	37.4	38.0	37.70
80.0	0.8	34.1	34.4	34.25
60.0	0.6	30.0	30.0	30.00
40.0	0.4	24.0	24.0	24.00
20.0	0.2	17.0	17.0	17.00

From the table 2 above, the same experimental result that was perform in table 1 was performed with change in mass of pendulum bob. The mass of pendulum bob is268.42g, at 100 to 20 cm to generate time (t₁, t₂ and t₃) in seconds in order to calculate the momentum and acceleration of the pendulum bob. The result shows that the higher the mass of the pendulum the lesser the time of oscillation.

Table 3: The experimental result for Pendulum of bob mass of 29.11g

L (cm)	L (cm)	t ₁ (s)	t ₂ (s)	t (s)
100.0	1.0	37.1	37.3	37.20
80.0	0.8	34.0	34.0	34.00
60.0	0.6	30.0	30.0	30.00
40.0	0.4	23.4	23.4	23.40
20.0	0.2	16.4	16.4	16.40

From the table 3 above, display the experimental result of pendulum with bob mass of is29.11g, at 100 to 20 cm to generate time (t₁, t₂ and t₃) in seconds in order to calculate the momentum and acceleration of the pendulum bob.

Table 4: The experimental result for Pendulum of bob mass of 69.26g

L (cm)	L (cm)	t ₁ (s)	t ₂ (s)	t (s)
100.0	1.0	36.9	37.8	37.40
80.0	0.8	33.5	34.1	33.80
60.0	0.6	29.5	30.0	29.75
40.0	0.4	24.2	24.2	24.20
20.0	0.2	17.2	17.1	17.15

From the table 4 above, display the experimental result of pendulum with bob mass of 69.26g, at 100 to 20 cm to generate time (t₁, t₂ and t₃) in seconds in order to calculate the momentum and acceleration of the pendulum bob.

The formulae for the slope, period and momentum are given below:

$$\text{Slope} = \frac{(T_2^2 - T_1^2)s^2}{(L_2 - L_1)m} \dots\dots\dots \text{eq 1}$$

where T = period
L = length of the bob

$$\text{Period (T)} = \frac{t}{n} \text{ (s)} \dots\dots\dots \text{eq 2}$$

Where t = time
n = number of oscillations

$$\text{Momentum} = mgt \dots\dots\dots \text{Eq 3}$$

Where m = mass of the bob in
g = acceleration due to gravity in m/s²
t = time taken in second

The number of oscillation used for these experiments was 20.

Table 5: Oscillation of pendulum with bob mass of 8.32, and the slope of 3.6475

L (cm)	L	t ₁ (s)	t ₂ (s)	t (s)	T=(t/n)(s)	T ²	Momentum
100.0000	1.0000	38.0000	38.1000	38.0500	1.9025	3.6195	171.3203
80.0000	0.8000	34.0000	34.0000	34.0000	1.7000	2.8900	153.0851
60.0000	0.6000	30.0000	29.0000	29.5000	1.4750	2.1756	132.8238
40.0000	0.4000	24.1000	24.0000	24.0500	1.2025	1.4460	108.2852
20.0000	0.2000	17.1000	17.5000	17.3000	0.8650	0.7482	77.8933

From the table above 5, the various values of momentum were generated and the mass of the bob which is 8.32g led to the patterns of the values for the momentum, and also the slope of 3.6475 was generated due to changes in acceleration due to gravity of 10.8233 for a given mass of 8.32g.

Discussion of Result

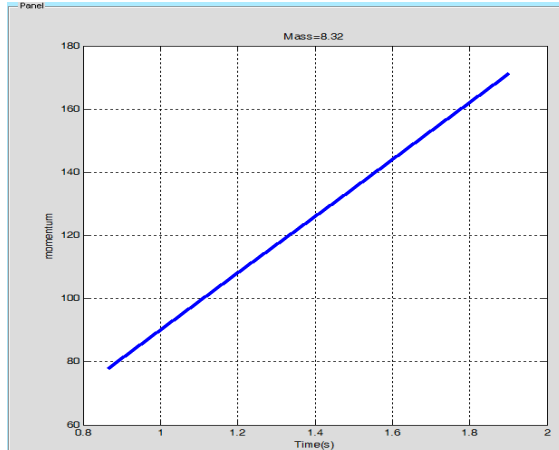


Figure 1: Graph for Momentum against Time with mass of 8.32g. This figure uses the data of time and momentum to obtain a straight line graph.

Table 6: Oscillation of pendulum with bob mass of 268.42, and the slope of 3.5220

L (cm)	L	t ₁ (s)	t ₂ (s)	t (s)	T=(t/n)(s)	T ²	Momentum
100.0000	1.0000	37.4000	38.0000	37.7000	1.8850	3.5532	175.7923
80.0000	0.8000	34.1000	34.0000	34.2500	1.7125	2.9327	159.7052
60.0000	0.6000	30.0000	30.0000	30.0000	1.5000	2.2500	139.8878
40.0000	0.4000	24.0000	24.0000	24.0000	1.2000	1.4400	111.9102
20.0000	0.2000	17.0000	17.0000	17.0000	0.8500	0.7225	79.2698

The table of Oscillation of pendulum with bob mass of 268.42, and the slope of 3.5220. Various values of momentum were generated and the mass of the bob which is 268.42g led to the patterns of the values for the momentum, and also the slope of 3.5220 was generated due to changes in acceleration due to gravity of 11.2090 for a given mass of 268.42g.

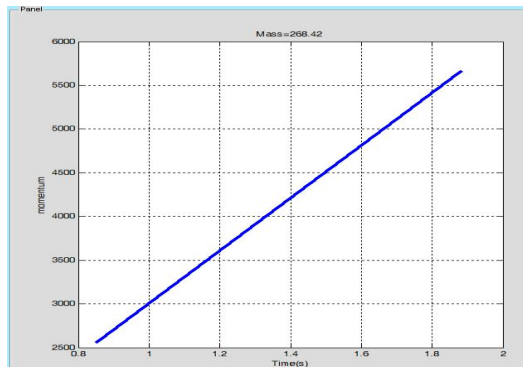


Figure 2: Graph for Momentum against Time with mass of 268.42g.
From figure 2 above, a straight line graph was formed which shows that as time increases the momentum also increases.

Table 7: Oscillation of pendulum with bob mass of 29.11, and the slope of 3.4845

L (cm)	L	t ₁ (s)	t ₂ (s)	t (s)	T=(t/n)(s)	T ²	Momentum
100.0000	1.0000	37.1000	37.3000	37.2000	1.8600	3.4596	171.3203
80.0000	0.8000	34.0000	34.0000	34.0000	1.7000	2.8900	153.0851
60.0000	0.6000	30.0000	30.0000	30.0000	1.5000	2.2500	132.8238
40.0000	0.4000	23.4000	23.4000	23.4000	1.1700	1.3689	108.2852
20.0000	0.2000	16.4000	17.0000	16.4000	0.8200	0.6724	77.8933

Oscillation of pendulum with bob mass of 29.11, and the slope of 3.4845. Various values of momentum were generated and the mass of the bob which is 29.11g led to the patterns of the values for the momentum, and also the slope of 3.4845 was generated due to changes in acceleration due to gravity of 11.3297 for a given mass of 29.11g.

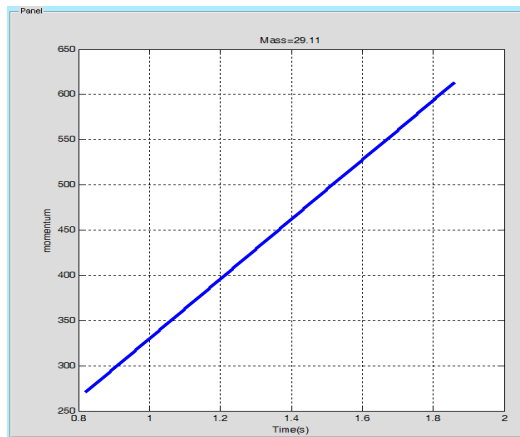


Figure 3: Graph for Momentum against Time with mass of 29.11g

From figure 3 above, a straight line graph was formed which shows that as time increases the momentum also increases.

Table 8: Oscillation of pendulum with bob mass of 69.26, and the slope of 3.4403

L (cm)	L	t ₁ (s)	t ₂ (s)	t (s)	T=(t/n)(s)	T ²	Momentum
100.0000	1.0000	36.9000	37.8000	37.3500	1.8675	3.4876	171.3203
80.0000	0.8000	33.5000	34.1000	33.8000	1.6900	2.8561	153.0851
60.0000	0.6000	29.5000	30.0000	29.7500	1.4875	2.2127	132.8238
40.0000	0.4000	24.2000	24.2000	24.2000	1.2100	1.4641	108.2852
20.0000	0.2000	17.2000	17.1000	17.1500	0.8575	0.7353	77.8933

From the table Oscillation of pendulum with bob mass is 69.26, and the slope is 3.4403. Various values of momentum were generated and the mass of the bob which is 69.26g led to the patterns of the values for the momentum, and also the slope of 3.4403 was generated due to changes in acceleration and gravity of 11.4752 for a given mass of 69.26g.

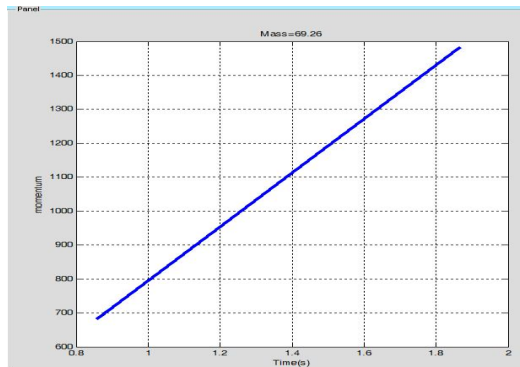


Figure 4: Graph for Momentum against Time with mass of 69.26g.

From figure 4 above, a straight line graph was formed which shows that as time increases the momentum also increases.

Conclusion

The study is concluded based on the experimental data generated from the experiments and software visualization programs in form of one and two dimensions. It is hereby concluded that: The higher the mass of the bob of the oscillating pendulum the higher the acceleration due to gravity. The mass of bob also determines the values generated for the momentum of the oscillating pendulum. Different types of slopes were generated based on the mass of bulb of oscillating pendulum. The mass of the bulb for any pendulum oscillation must be given so that the values of period, momentum, and slope generated can be uniform and differentiated from other type of oscillating pendulum with different mass of bulb. To get the accurate value of acceleration due to gravity, it is recommended to use the minimum size of the bulb.

Recommendations

From the output obtained, simple pendulum is independent of mass, which is consistent with the uncertainty of the measurements made with the stopwatch. (Time is measured to the nearest .01 s, which corresponds to an uncertainty of 0.9% in the period, but we might expect the uncertainty of the measurements to be slightly larger than that since the stopwatch itself is somewhat imperfect and there is some small variation in the reaction time of the experimenter.)

The period was found to be dependent on the $1/2$ power of the length, with an error of 1.8%, but the range of values for the power dependence of T on L (taking calculated

uncertainty into account) does not include the expected value of 0.5. Our value of g was within 1.2% of the theoretical value, the range of experimental values obtained for g does not quite include the expected experimental value. These differences are small and can probably be explained by some of the small errors listed above, which were not necessarily accounted for in the uncertainty calculations. Hence the results seem to be in agreement with existing theory, but in order to determine this for certain, we would need to do further investigation, attempting to control some of the variables.

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CITIZENSHIP INFORMATION MANAGEMENT CARD SYSTEM FOR EFFECTIVE USAGE

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Abstract

The system 'Citizenship Information Management Card System' provides information about citizens within a country. The issue of multiple identification card and problem of identification has caused several organisations to have a means of identifying their client and staff. However, this conceptual study proposed a system that generates a unique citizen Identification that finds the personal information of individuals in each and every department or services. This information can be queried with the unique Identification of the citizen. Presently, citizens utilize the services and utilities of the Government or Private organizations by going with a particular Identification of that department. Instead, a citizenship information management card system helps in having all the utilities and services under one unique Identification. The use of Information Technology to achieving the said system needs proper design and effective implementation by allowing a flexibility for the citizens, and the importance of the system that allows citizens with the easy access to necessary services. This conceptual study uses the first stage of system development as a method for this study to which requirement analysis was carried out and information gathering of the existing system was conducted. The system will allow citizens, government and corporate organization the ease to verify information and allow easy access to service with less effort, using concept of distributed computing which allows interactive devices and interface at both ends. This study presents the citizenship information management card system for effective use of citizens' information without replication and redundancy, with easy access to the relevant authority and elimination of corrupt practices within the society.

Keywords: card system; citizen information; corruption; technology usage; identification number

Introduction

Information Technology plays tremendous role in the development of citizens and the government of various countries. Nigeria, a country with less than 200 million is presently capturing the identity of its citizenry through the national identity program, bank verification number, plate number registration, mobile phone number registration, international passport, drivers' license registration through the means of Information Technology which are all ongoing however, there exist a number of citizens who are yet to register or obtain their identification card and this results to the private sectors creating their own identification (Obi, 2006).

According to National Identity Management Commission (NIMC, 2014), there is currently no centralized national identity database and no system of National Identity Management which efficiently links public and private sector identity schemes. This could be due to improper documentation of citizens' identification, issue of trust by private organisation and redundancy or multiple identification among the citizens.

While the financial services organisation are proactive in the identification of its customers for effective delivery of goods and services, several other identification schemes and database by other institutions offering services to the citizens led to the redundancy to citizen's identity. Government parastatals also hold several databases with no integration of access or interoperability to enhance the delivery of services within these government institutions. According to (Froomkin, 2007) when a non-mandatory card are introduced, its improvements on the authentication, making it mandatory and addition of other biometric increases attention on how collected data will be accessed after being stored. This biometrics could include fingerprints, medical data, iris measurements, driving records (Krajewska, 2010). A reliable and flexible identification system that verifies individual's identity is still being figure out which introduces the National Identification Number (NIN), and a means of having a secured database of the citizens (Omoniyi, 2012). This may lead to having a reliable network among the database of these different organization linking one another to form a secure, reliable and flexible database that will be a sole responsibility of the government, in order to collect, manage, and give access to the relevant organization and authority who are to access the citizens' information.

Therefore, allowing the a unique and single database of the government being the sole database that supply all the necessary information of the citizens to the relevant organization which can easily be query by these organization both the public and private, and other relevant authorities such as the security and law enforcement authorities. This study is not pointing out merit and demerit of the current identification, such as the card system, the infrastructure and technical know-how, however this conceptual study, tend to conceptualize and propose a system by which card system could be manage in order to allow effective usage and reduce redundancy.

The Citizenship Information Management Card System

The Citizenship Information Management Card System will provide every legal resident in the country, including foreign nationals, an easy and secure way of demonstrating their right to be within the country and asserting their place in the community. It will be linked to the person to whom it is issued by unique identifiers along with more traditional security checks, in such a way that it will be virtually impossible to obtain an Identity card in multiple identities.

According to Akinlabi (2006), who made emphasis on having a reliable and uncompromised identification system for citizens, this help in actualization of identification by census board, immigration, national planning, election, law enforcement, banking, tax collection, pension board, education and in fact the judiciary. Lack of this identification system had caused the citizens losing out in the dividends of the government's responsibility to its citizens while the government cannot properly

plan, it also breed corruption and other malpractices such as the issue of ‘ghost workers.’ However, having this identification which helps the verification of workers will help the government to eliminate the redundant payment of salary and wages to non-existing workers.

This identification system will be capable of maintaining the details of the entire citizens in an effective manner and it will be a user friendly application in which each and every task related to citizen will be performed efficiently. These therefore provides facility for identification and verification services to other entities such as Ministries, financial institutions, Hospitals, Road safety officials, Police and other authorized personnel. It provides a unified smart Identification card for Nationals and Residents, Interface with other systems such as: labor, health, justice, education, and telecommunication. The system will build an integrated information database for the entire population, eligibility or ownership verification would be facilitated by attempting to buy age-restricted products or identify drivers’ age and eligibility.

The system allows citizens to apply on-line through this flexible system and be scheduled for the date and time to complete their registration, web-based user interface allowing citizens to log-on using their smart card and view the details stored about them on-line, support for web-based enrolment system for a number of services without completing multiple forms such services include library, proof of age, e-purse, staff card, payments, citizen cards can be a useful administrative tool that can increase efficiency in dealing with both the government and private companies, commercial organization such as banks typically do not try to authenticate the identity of a person, but rather the validity of a transactions (e.g. by signature or PIN) due to the acknowledged difficulty in reliably identifying an individual in a fraud proof and convenient manner, potential reduction of fraudulent financial activities. An identity card can accompany any purchase and requested by the seller. Biometrics would make it harder to fraudulently obtain cards. Cards could not be bought off the street with a photo superimposed, and airline boarding would be more efficient and officials screening passengers could quickly verify identities. Law enforcement agents could quickly identify and verify the individual through their card and the use of card reader for the purpose intended. With the unique National Identification Number known as NIN (Omoniyi, 2012) introduced within the concept of Citizenship Information Management Card System both the residents and the government will require less stress in identification processes however, Alkhurayyif (2013) maintained that passport is a suitable document that can be used to prove identification both nationally and internationally.

National Identification Number

A national identification card is part of a system in which a unique identifier, a national identification number (NIN) is associated with every citizen of a given country, just like

the Bank Verification Number (BVN). A national identification number is used by the governments of many countries as a means of tracking their citizens, permanent residents and temporary residents for the purposes of work, taxation, government benefits, health care and other functions. While different countries have different views on using national identification, many countries are positive towards having a national identification system (Hiltzet *al.*, 2002:1).

The unique NIN is principally to give the country a dependable database of the count of its citizens and other residents. The NIN is a non-intelligent numbers given to individual in order to differential two individuals with exact name upon enrolment (Osunade, Olanrewaju and Phillips, 2013). Enrolling for NIN will require an individual's demographic data and capturing of the upper part of the body, head to shoulder facial picture, all fingerprints of both right and left hand, including other biometric features and signature which are used to check existing data for redundancy and multiple registration in the system database, for confirmation, nonexistence of the same data. After successful data capturing and found to be unmatched, the data is then stored and the unique number known as NIN is then generated (Omoniyi, 2012). This set of numbers uniquely assigned to individuals will be embedded within the smartcards issued to citizens. When NIN is issued to a person, it signifies that the number cannot be in use again to avoid replication and safe storage of individual information even if the person having the NIN is deceased. Individuals are easily refers to, using this set of number which instantly identifies them within the database by calling the number, and gaining access to the database will only be by request and authorization by organization which can only have access to data of individuals that are relevant to their organization.

The NIN when implemented must be a requirement for every citizen and legal resident so as to helps the government in decision making and planning, it differentiate two or more people with the same names and makes identification easier. According to Osunade, Olanrewaju and Phillips (2013), information such as home address, phone number(s), date of birth, parents' information, DNA information, criminal record, vehicle registration, vehicle insurance, plate number registration, driving record, marriage information and even employment record of people should be stored with the number. This will allow a full information of individuals, avoidance of multiple registration in both public and private organization and ease individual access to amenities without further registration on spot.

Throughout the globe, Identification cards are used to provide citizens with access to specialized resources, benefits and privileges. The project citizenship information management card system will offer an end-to-end solution that will help government increase security, maximize efficiency of a wide variety of identification programs, good decision making and planning appropriately. If an organization wishes to ascertain the identity or age of one of its users, the third party information company can call for

the information supplied against details held on the Citizenship information management card system central database.

Approaches Taken by Nigerian Government

Aginam (2008) highlighted approaches taken by the government such as the synchronization of data among the Central Bank of Nigeria (Bank Verification Number), Federal Road Safety Commission (drivers' license database), Independent National Electoral Commission (Permanent voters' card), Nigerian Communications Commission (SIM card registration) and NIMC in order to have a single national database, which will effectively have full details of Nigerians. The national identity programme which is ongoing is incomplete (Osunade, Olanrewaju and Phillips, 2013) due to less participation by Nigerians, resulting to lack of identification by those who do not drive and not having drivers' license, those who don't use mobile phone and those who are still having doubt about the process of identification.

The Federal government through Ministry of Finance and other parastatals try to capture civil servants data by means of salary payment using the IPPIS platform. Recently, the President ordered the military and universities to join IPPIS platform (IPPIS, 2015), this could be means of having data of all other employees available and can later be synchronized to form an identification. The issue of carrying multiple identification still remain and the validation and identification still remain an issue however, with a single card, having the NIN, and the use of card reader by organisation and enforcement agencies will also resolve the validation, identification, malpractices and corruption. Government approaches are highlighted in Table 1.

Significance of the System

The essence of this system is to design a modern population register and identity management system that provides a secure and safe environment for citizens and residents while protecting people privacy and supporting the planning of allocation of resources, benefits and services, promoting economic growth. Whereby the front-end partners (FEP), of the NIMC agreed with, central bank Nigeria (CBN), mobile phones operator and other private and governmental agencies to capture citizen's biometrics, giving the National Identity Numbers (NIN) and the General Multi-purpose Identity Cards (GMPC), and providing infrastructure for verifying and linking bank accounts, mobile phone number, National health identification number to the issued NIN within the NIMC data base (Osunade, Olanrewaju and Phillips, 2013).

Table1: Highlights of the Nigerian Government Approaches

S/N	Project/sector	Year implemented	Issues of previous approaches by Government
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1	INEC Electronic Voters Register	In progress	Only interested voters obtained the card
2	NHIS Patient Card	2005	Only the Federal Government employee
3	National ID Cards	In progress	Lack of will to register
4	FRSC	1990	Only drivers
5	University student ID	2001	Only students
6	Value Card	1998	Only for interested bank customers
7	Pen Com National Database	In progress	Next of Kin to deceased
8	ECOWAS Harmonized E-passport	In progress	Only among travelers
9	State Governments	2003/2004	Disparities among different States
10	Bank Verification Number	In progress	Unique number peculiar to bank customer

(Source: www.nimc.gov.ng.)

This system will be capable of providing the information related to Citizens within a country in a click that provides every needed information and allow the citizen access to services without the use of multiple identification. Every country has its own citizen policies in which each and every citizen will have their unique national ID through which the personal information of each citizen will be verified and updated. In order to get work done from any government based offices, using the citizenship information management card system, users can perform different activities such as paying for bills such as telephone bills, electricity bills, mobile phone recharge, tickets booking as well as bank services which include taxing services, insurance services, mobile transfer, credit card services, credit rating system, by making use of the credit rating systems, the personal information of the user can be identified through which the person's character can be noticed.

The Citizenship information management card system will keep details of citizens on a central database so that if some organization or authorized person queries a citizen's card, the organization or the person querying the card will be able to confirm the legitimate cardholder and the system will store the details of the query, such as the time, date and the organization that calls the data. Third party information company can have access to a fraction of the citizens card central database for the purpose of age validation, identity authentication, fraud prevention and use of such information provided by the citizen, because many organizations need to be sure of their clients age or identity and can directly copy from the database so as to save the citizen time to fill multiple forms with the same information. Using a Citizens Card will be mandatory, because it will make life much easier. Even if a citizen have an international passport, Citizenship information management card system means the citizen can leave this valuable

documents safely at home. Citizens will not require a “card” for driving license as such authorization will be involved within the Citizen Card. Using a Citizenship information management card system means that the citizen can access the products and services to which citizens are entitled to.

System Components and Description

Any national identification system should be based on four key components:

1. *An identity verification system:* This will verify the identity of the person by using biometric features.
2. *A database:* this serve as the storage location for the information of the citizens.
3. *A card:* the smart card that could be presented on a request or for verification.
4. *A card verification system:* This will verify the authenticity of the card and the details that are allowed access to the authorized person or organization, such as the card reader.

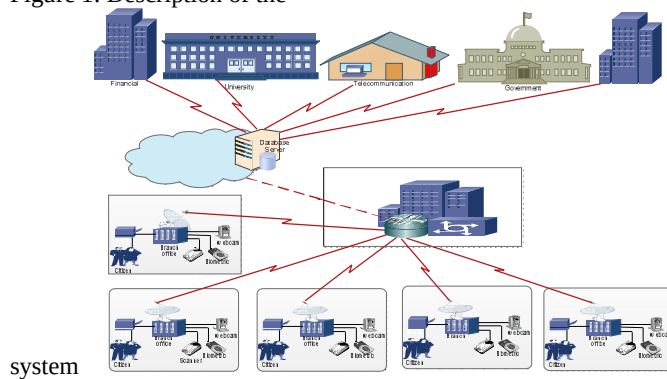
While the card is the most visible of these components, without the other components working together, the card is not especially useful. Before a card can be issued, there must be some means of assuring that the person receiving the card is who he or she claims to be, due to this, any identification system is only as good as its ability to verify an identity in the first place. Issuance of the identification is accompanied by the entry of the person's identifying information into a database. But an ID database, no matter how sophisticated, only gives basic information about the person identified: weight, height, hair and eye color, address.

Proponents of new national identification systems believe that adding technological features to the cards themselves will eliminate problems inherent to such systems, like fraud and forgery. History does not smile on this belief. If a card can be affordably mass-manufactured, it can also be forged. The addition of hi-tech features such as embedded smart chips, biometric interlocking, and linking of card data to databases, all promise to make cards less forgeable, and for a while will succeed. However, a cruel paradox of identity card systems is that the more secure a card is, the greater its value, and the greater the incentive and reward for breaking the card.

Finally, deriving any value from building enhanced hi-tech security measures into a national identification system will require massive card verification architecture. Putting a microchip on an ID card only improves it if there is a fair chance that a police and road safety officers, airport gate worker, banking officials or other personnel who should have cause to inspect the card has a machine capable of reading its advanced features. The police officer and road safety officials only need a card reader to verify the age of the driver and the validity of his driving license which is embedded with the information of the driver in the database.

The client who also is a citizen or resident goes to the branch office for registration. The necessary biometrics are captured and the information send to Central site with Access Server (the client can register and check his data due to the flexibility) this is stored in the Database Server. The financial institution, University, Telecommunication, Government, hospital and relevant government enforcement authorities will access information relevant only to their job at that particular moment.

Figure 1: Description of the



Scenarios

A client, after obtaining the identification card which has the National Identification Number (NIN) will use the card in the following scenarios.

Bank Scenario:

1. The client walk to the bank to open a bank account, instead of filling all the form required, the client present his Identification Card and only the relevant information is retrieved from the card by the bank through the NIN.
2. The client walk to the bank to withdraw money and other services, to validate and identify the client, the bank use the card reader to check relevant information on the Identification card.

Law Enforcement Scenario:

1. The officer stops the client to check the vehicle registration, driving authorization, and personal identification, the client present the Identification card to the officer. The officer use the card reader to retrieve the information of client such as the age (18 years for driving permit depending on the law of the land), the card reader shows client authorization to drive and the validity of the authorization.

Hospital Scenario:

1. The client presents his Identification card to the desk officer, enter the NIN and verify the Insurance scheme and then direct the client to the appropriate office.

These scenarios show a few from the relevancy of the citizenship information management system that has the NIN, it makes it easier for the client who happens to be the citizen or resident of a country and also easy for the officers who need to verify the people who seek the services of different parastatals.

Conclusion

The system had signifies the use of citizenship information management card that captures all the necessary and useful information of a citizen in a country whereby giving the public and private organization less stress in identifying and verifying the citizens. With the help of the present data captured by the banking section, the BVN had becomea stepping stone into achieving the NIN. This system also create an avenue for less stress of filling forms and other documentation, which can easily be retrieved by providing the identification card in which the national identification number is retrieved the authorized personnel. This study presents the citizenship information management card system for effective use of citizens' information without replication and redundancy, with easy access to the relevant authority whereby eliminating corrupt practices within the society.

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BARRIERS TO EFFECTIVE USE OF LIBRARY RESOURCES AVAILABLE AT FATIU ADENOLA AKESODE LIBRARY LAGOS STATE UNIVERSITY, NIGERIA

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Abstract

Libraries in Nigeria have a lot of resources for their clientele especially university libraries which are funded by the government. Many of these resources are not well utilized due to some impediments or barriers. This research proposed to proffer solutions to discovered barriers. Two Hundred (200) undergraduate students across the faculties and departments in Fatiu Adenola Akesode Library formerly known as Lagos State University Library (LASU) were involved in the research. Survey research design was used while data collection was done by means of questionnaire administration. The findings revealed frequent power outage, none allowance to use flash drives to copy from the library's computers, short duration of borrowing period, among others as the main barriers to effective undergraduate students' library usage at Lagos State University. The study concluded that the undergraduate students in Lagos State University have very little interest in library use due to a number of challenges ranging from frequent power outage, inadequate internet facility and poor computer networks. Among the recommendations made were that there should be an alternative place where students would print documents selected from the internet and increased internet accessibility by increasing the university's broadband.

Keywords: Library use, Library resources, Resource availability, Barriers.

Introduction

Information resources availability, accessibility and use are important factors in knowledge acquisition, learning and research. Indeed, every academic library, regardless of size, is expected to have adequate information resources available for its community for reading, learning and research. Chambers English Dictionary described the term 'available' to mean the state of being physically present, within easy reach of users. In this research, information availability is regarded as the information resources that are in the library which are within the reach of users. Information accessibility on the other hand refers to resources being effectively and independently reached and utilized. When users of the library are informed of the available materials, it is expected that those resources would be well organized for easy access.

The Lagos State University Library now Fatiu Adenola Akesode Library was established under the Lagos State University Law. The Library thereafter became operational at the assumption of the University Librarian on 7th May, 1984. The Library had an initial 2,281 volumes of books in 1984 and had about 60,000 volumes in the year 2006. As at 2015, the university library had 89,000 volumes of books. Similarly, the academic journal subscription rose from 741 to 3,000 in 2006 and over 5 000 in 2015.

It is one thing to have resources available and it is another to make effective use of those available resources. This paper looked at the hindrances to the use of the available resources in Lagos State University Library, otherwise known as Fatiu Adenola Akesode Library. The study centered on the students' perception of library holdings, frequency of library use among undergraduate students and the motive behind students' use of library. The output of this research will contribute to existing literature in information resources management field. It is hoped that the findings of this study will go a long way to reveal the actual state of information resources availability and use in Lagos State University Library and highlight the barriers to effective information use in the library.

Academic libraries acquire, organize, store and disseminate information with a view to improve information availability, accessibility and use. However there has been a decline in the level of library utilization in many Nigerian academic libraries due to access from remote places using the Internet. This study sought to investigate the hindrances to effective library use among undergraduate students using Lagos State University as a pilot study.

Objectives of the study

The purpose of the study is to find out the hindrances to effective library use among undergraduate students in Lagos State University (LASU). This was achieved by means of the following specific objectives which were to:

1. ascertain the frequency of use of different library collections among undergraduate students of Lagos State University;
2. determine the undergraduates' purpose for using the library; and
3. determine the barriers to effective use of library resources by undergraduate students, in Lagos State University.

Overview of Libraries

One of the main objectives of establishing a university is to promote scholarship research and learning in the various fields of learning. National Policy on Education opines that one of the goals of university education is to acquire both physical and intellectual skills which will enable individuals to become self-reliant and useful members of the society (FME, 2004). Behind the mission and vision of the university education is the academic library which serves the community (Eze & Uzoigwe, 2013).

Libraries are seen as repositories of human experiences and knowledge. Although, libraries have changed significantly over time, their cultural roles have remained essentially the same. Libraries are still responsible for acquiring and providing access to books, periodicals, and other media that meet the educational, recreational and information needs of their users. In order to effectively sustain their cultural roles, libraries have been categorized into different types to render effective service delivery and to satisfy the information needs of several users.

Momodu (2015) observed that academic libraries were the efforts of several transformation advancements that began many years ago outside of the country. 'Yesterday it was merely houses that accommodate books for the purpose of protecting them. While today it is a physical building that provides knowledge and information to researchers and students of its home institution, tomorrow it is expected to be an intellectual and national bounties'.

According to Ugwanyi (2004) and Akporhonor (2005) an academic library is a library that takes care of the people engaged in academic and research work in the institution of higher learning. Such institutions include the libraries found in universities, colleges of education, colleges of technologies and polytechnics. It is a meeting point for different people requiring the service through effective communication and services delivery as cited by Ifidion, et al, (2008). Sing and Kaur (2009) stressed that preservation and access to knowledge and information is the main mandate of academic libraries alongside supporting the mission of their parent institutions which is teaching and research.

Oyegunle (2013) posited that academic libraries are the only education centers established in support of the mission of their parent institution, generate knowledge and to equip people with knowledge in order to serve the society and advance the well-being of mankind. Hence, academic library is very significant if tertiary institutions are to meet its purpose. Agboola and Bamigboye (2011) also maintained that the quality and strength of any educational programme depends on the library and not the magnificent building but the use of it. Supporting this view, Nwozeh and Shabi (2011) projected library as a potential educational force in the university community of staff and students of different levels.

The emergence of information and communication technologies has affected the role and services of academic libraries. Etim ((2004) noted that, the rapid pace of development of networked information services have prompted comprehensive review of the library and information science profession. There is a clear paradigm shift from manual ways of carrying out information services controlled by analog data to electronic ways of accessing and retrieving information controlled by electronic gadgets. ICT according to Abubakar (2011) is being introduced and included into all aspects of library services for the university libraries to be where their users are and they have to

fully recognize the fact that the world is living in virtual realities as was indicated by Omekwu and Echezona (2008). Users of academic library are now expecting to be given what they need, where they need it and from which ever location they may by (Ajogboye , 2010). Thus, university libraries are expected to provide to users a range of ICT and e-resources necessary for retrieving information quickly from both immediate and remote databases, as well as creating a need for library cooperation and consortium initiatives in the opinion of Eze and Uzoigwe (2013).

A good numbers of factors had been identified as hindrances to the adequate provisions of library and information services and resources by academic library. According to Ifijeh (2011) one of the major factors is the low budgetary allocation for education. Similarly, Akin and Ajayi (2005) also noted that the Nigerian education sector and in particular Nigerian university libraries are yet to recover from the economic down turn of the 1980s and the subsequent impact of this is the underfunding of the university libraries. To this end, Nwezeh and Shabi (2011) recommended that in order to serve the patron better the university libraries should re-address the issue of library orientation for new students, aggressive and large scale user's education, provision of functional library building and making library environment comfortable and pleasant among others. Besides, Ifidon and Okoli (2002) noted that the nature of library staff is a factor that inhibits effective library services. They further stressed that most of the staff went through the traditional form of training in which some of them just refused to adjust to the new situation, but want the status quo to remain.

Researchers like Oyesiku and Oduwele (2004); Oluwadare (2006); Yusuf and Iwu (2010), assert that even though libraries are being used, they are reduced to seasonal places of reading as most students make use of the library when preparing for examinations. In situations where libraries were seen to have recorded high patronage, evidence abound that users face a variety of challenges including, but not limited to, difficulty in catalogue use, obsolete materials and poor shelving (Okere and Onuoha, 2008; Amkpa, 2000). In the face of all these Frascotti, Levenseler, Weingarten, and Wiegand, (2007) argue that libraries are trying to re-invent themselves to be more appealing. No wonder then, that many libraries within an outside Nigeria now go beyond the provision of print information resources to the provision of electronic information sources as well as employing ICT use in different areas of services.

Methodology

This study adopted survey research design that involved the collection of data using self-administered questionnaire. The study population was the undergraduate students of LASU. As at the 2014/2015 academic session, the university had a student population of 21,000 of full-time undergraduate students (LASU Registry). Araoye (2004) submitted that 50 respondents is a minimum number to be used for a research sampling. In this research 200 students were randomly selected being one and half percent of the

total population. It is considered adequate because it is more than the minimum number required to make a generalization. Questionnaire was the instrument used for data collection. The research questionnaire was self-constructed. Three Research Assistants were adequately trained to administer and retrieve the questionnaires. Validity and reliability tests were carried out using the professionals in the field and Cronbach's alpha analysis for validity test.

Table 1: Cronbach' Alpha test result

Parameters	Cronbach's Alpha	Cronbach's Alpha Result	No. of Items
frequency of library use	.941	.941	7
Purpose for using the library	.953	.954	12
barriers to effective use of library resources	.917	.918	31

Data collected were analyzed using a Statistical Package for Social Sciences (SPSS) version 20. Both descriptive and inferential statistics such as simple percentage, mean and standard deviation were used in analysis.

Data Presentation, Analysis and Discussion of Findings

This section presents the analysis, results, and interpretation of findings.

Table 2: Respondents Socio-demographic Characteristics

Parameters	Classification	Frequency	Percentage
Age	15-18	54	27.0
	19-22	109	54.5
	23-26	32	16.0
	27-30	5	2.5
	Total	200	100.0
Gender	Male	95	47.5
	Female	105	52.5
	Total	200	100.0
Level	100 level	101	50.5
	200 level	83	41.5
	300 level	2	1.0
	400 level	13	6.5
	500 level	1	.5
	Total	200	100.0

Table 2 showed the demographic representation of the respondents. As undergraduates, majority of the respondents (54.5%) were in the ages of 19-22 years followed by 15-18 years accounting for 27%. Majority of the respondents 52.5% were females. Half of the respondents were 100 level students. They were readily available to fill the questionnaire.

Research Questions 1: What is the frequency of use of different library collections by the students of LASU?

Table 3: Students' frequency of library use

Library Resources	Daily	Weekly	Monthly	Occasionally	Never use the library
Special Collections	19(9.5)	34(17.0)	26(13.0)	60(30.0)	61(30.5)
Students Long Essays (Projects)	23(11.5)	38(19.0)	31(15.5)	55(27.5)	53(26.5)
Journals	19(9.5)	60(30.0)	13(6.5)	55(27.5)	52(26.0)
Magazines	40(20.0)	36(18.0)	27(13.5)	51(25.5)	44(22.0)
Electronic Online Resources	57(28.5)	31(15.5)	14(7.9)	48(24.0)	50(25.0)
Newspapers	75(37.5)	27(13.5)	13(6.5)	41(20.5)	44(22.0)
Text Books	77(38.5)	43(21.5)	6(3.0)	39(19.5)	35(17.5)

Table 3: showed that the most consulted items in the library, counting on the combination of daily and weekly uses, were textbooks 60%, newspapers 51%, electronic online resources 44%; while the least used resources were special collections and students' long essays. These findings indicated that the undergraduates were not yet aware of the importance of students' long essays as samples of what they will do in near future of their stay at the university. They are used to textbooks and they continued to have affinity with them.

Research Questions 2: Why do undergraduate students use the library?

Table 4: Students' purpose for using the library

Purposes	SA	A	D	SD
To watch movie/listen to music	44(22.0)	70(35.0)	60(30.0)	26(13.0)
To check my e-mails	68(34.0)	73(36.5)	33(16.5)	26(13.0)
To use social media	38(19.0)	52(26.0)	65(32.5)	45(22.5)
To read newspapers	45(22.5)	71(35.5)	66(33.0)	18(9.0)
To use e-journals	81(40.5)	55(27.5)	42(21.0)	22(11.0)
To consult journals	58(29.0)	72(36.0)	63(31.5)	7(3.5)
To prepare for practical classes	26(13.0)	27(13.5)	77(38.5)	79(35.0)
To use e-books	41(20.5)	44(22.0)	60(30.0)	55(27.5)
To consult projects	96(48.0)	71(35.5)	17(8.5)	16(8.0)
To read for examination	131(65.5)	41(20.5)	23(11.5)	5(2.5)
To do assignment	128(64.0)	66(33.0)	6(3.0)	0(0.0)
To consult reference materials	151(75.5)	45(22.0)	4(2.0)	0(0.0)

Table 4 shows that the main purpose of visiting the library by majority of the undergraduate students was to consult reference materials (97.5%) and to do assignments (97%). Closely following these two was to prepare for examination followed by consulting projects. Using the library for social media and e-books were the least reasons for visiting the library.

Research Questions 3: What are the barriers to effective use of library resources by the students of Lagos State University?

Table 5: Barriers to effective use of library resources by the undergraduate students

Barriers	SA (%)	A (%)	D (%)	SD	Mean	SD
Poor organization of the materials on the shelves	25(12.5)	47(23.5)	80(40.0)	48(24.0)	2.8	1.0
Lack of organization in the library	26(13.0)	41(20.5)	85(42.0)	48(24.0)	2.8	1.0
The library has little or no resources in my course of study	28(14.0)	43(21.5)	66(33.0)	63(31.5)	2.8	1.0
The library is usually dark and this discourage reading	28(14.0)	45(22.5)	64(32.0)	63(31.5)	2.8	1.0
Users are not educated on how to use the library	20(10.0)	52(26.0)	74(37.0)	54(27.0)	2.8	0.9
The library has no guide to direct users to appropriate sections of the library	31(15.5)	40(20.0)	70(35.0)	59(29.0)	2.8	1.0
Late arrival of newspapers	27(13.5)	56(28.0)	66(33.0)	50(25.0)	2.7	1.0
Ineffectiveness of the library catalogue	37(18.5)	42(21.0)	75(37.5)	46(23.0)	2.7	1.0
Collections are inadequate	31(15.5)	46(23.0)	78(39.0)	45(22.5)	2.7	1.0
Collections are not relevant	31(15.5)	43(21.5)	72(36.0)	54(27.0)	2.7	1.0
The library environment is not conducive/friendly for reading and learning	40(20.0)	36(18.0)	66(33.0)	58(29.0)	2.7	1.1
The library staff are not friendly and therefore scare users away from the library	28(14.0)	67(33.3)	64(32.0)	41(20.0)	2.6	1.0
Inadequate current textbooks	43(21.5)	53(26.5)	61(30.0)	42(21.0)	2.5	1.1
Unfriendly attitude of Library staff	46(23.0)	54(27.0)	64(32.0)	36(18.0)	2.5	1.0
Closing hour is short	43(21.5)	57(28.5)	64(32.0)	36(18.0)	2.5	1.0
Not allowed to use flash drive to copy	36(18.0)	65(32.5)	69(34.5)	30(15.5)	2.5	1.0
Ringling of phones	47(23.5)	47(23.5)	66(33.0)	40(15.0)	2.5	1.1
Inadequate current journals	36(18.0)	56(28.0)	78(39.0)	30(15.0)	2.5	1.0
Duration of borrowing is Short	37(18.5)	64(32.0)	63(31.5)	36(18.0)	2.5	1.0
Lack of adequate assistance from the library staff	35(17.5)	68(34.0)	70(35.0)	27(13.5)	2.4	0.9
The library is deficient in electronic library services	47(23.5)	55(27.5)	61(30.5)	37(18.5)	2.4	1.0
Poor Internet connectivity	40(20.0)	69(34.5)	62(31.0)	29(14.5)	2.4	1.0
Frequent power outage	83(41.5)	59(29.5)	26(13.0)	32(16.0)	2.0	1.1

The analysis in Table 6 was done on a 2-way scale of Agree and Disagree by merging Strongly Agree with Agree and Disagree with Strongly Disagree. This gave a clearer understanding of the barriers and would give a different interpretation. So, Table 6 is the same result arranged in a descending order for clarity before its interpretation.

Table 6: Barriers to effective use of library resources by the undergraduate students arranged in descending order

S/N	Barriers	A (%)	D (%)
1	Frequent power outage	142(71)	58(29)
2	Not allow to use flash drive to copy	111(55.5)	89(44.5)
3	Duration of borrowing is Short	111 (55.5)	99 (44.5)
4	Poor Internet connectivity	109(54.5)	91(45.5)
5	Lack of adequate assistance from the library staff	103(51.5)	97(48.5)
6	The library is deficient in electronic library services	102(51)	98(49)
7	Closing hour is short	100(50)	100(50)
8	Inadequate current textbooks	96(48)	104(52)
9	The library staff are not friendly and therefore scare users away from the library	95(47.3)	105(52.7)
10	Ringling of phones	94(47)	106(53)
11	Inadequate current journals	92(46)	108(54)
12	Unfriendly attitude of Library staff	87(43.5)	113(56.5)
13	Late arrival of newspapers	83(41.5)	116(58.5)
14	Ineffectiveness of the library catalogue	79(39.5)	121 (60.5)
15	Collections are inadequate	77(38.5)	123(61.5)
16	The library environment is not conducive/friendly for reading and learning	76(38)	124(62)
17	The library is usually dark and this discourage reading	73(36.5)	127(63.5)
18	Users are not educated on how to use the library	72(36)	128(64)
19	Collections are not relevant	72 (36)	128 (64)
20	Poor organization of the materials on the shelves	72 (36)	128(64)
21	The library has little or no resources in my course of study	71(35.5)	129(64.5)
22	The library has no guide to direct users to appropriate sections of the library	71(35.5)	129(64.5)
23	Lack of organization in the library	67(33.5)	133(66.5)

Frequent power outage is the greatest problem observed by the respondents with 71% agreement. This was followed by non allowance of users to copy information with their flash drive and duration period of borrowing which they complained was too short (55.5% each). Lack of resources in students' course of study (71%), no guide to direct students to resources (71%) and lack of library materials' organization (67%) were the least that constitute barriers to students' effective use of the library.

Except item one, frequent power outage that is clear from the respondents as posing a high barrier, all other items were in dispute. Where half agreed and half disagreed it means that there was no clear cut decision to be made. Even though all the statements were barriers, majority of the students do not see them as barriers. Out of the 23 items listed, only on 6 of them were merely above half of the respondents agreeing on the items being barriers to their use of the library. In all of the other 17 items the respondents (library users or students) disagreed that they constituted barriers. It was only on closing hours being short that there was a split draw 50-50.

Discussion of the findings

The key findings from this study revealed that the most frequently used library information sources by the Lagos State University undergraduate students were special collections, long essays otherwise known as projects, that is, past students' projects submitted to the library, and journals and magazine, textbooks were the least reason why they always visit the library. The main purpose for LASU students' use of the library was to watch movie, check e-mail, and use social media. While barriers to the use of library were listed as frequent power outage, not allowing the students to copy with their flash drives, short duration of borrowing period, poor internet connectivity, lack of adequate assistance from library staff, and deficiency in electronic library service. This is in support of a study by Agyekum and Filson (2012) on the use of libraries resources by student in Ghana schools found that most of the students use library resources and services to supplement their class notes, assignments and helped them in examination preparations. Similarly, a study by Clabo (2012) sounded the same with his findings that students use library information resources for recreational readings and for reference purposes.

In addition, several scholars have addressed the problem facing students' use of library for example, a study by Adeyemi (2009) in Nigeria found out that poor quality of library resources, scarcity of current reading and research materials were the challenges facing students in using libraries. Arua (2011) observed that poor library accommodations, poor library orientation and restricted library hours were major factors militating against the use of school libraries. Furthermore, a study by World Bank (2008) penned down the under listed problems facing libraries in sub-Saharan African countries as critically inadequate funding; lack of sufficient library premises; lack of money to undertake regular maintenances; collections are generally old and often irrelevant to current curricula and poor library management among others.

Finally, Iwhiwhu and Okorodudu (2012) stated that satisfaction is the function of three main sources: quality of the information resources, the information system and the services that make the information product available. Therefore there is need to improve libraries by providing quality and quantity materials in order to meet the increasing information needs of users

Conclusion

The study concluded that the undergraduate students in Lagos State University have very little interest in library use due to a number of challenges ranging from constant power failure, inadequate internet facility and poor computer networks. The study also concluded that the students have preference for electronic resources than the print resources in the library. Though the focus of the study was not on purpose for using the library yet it is pertinent to observe that students of LASU use the library mainly to consult reference materials (97.5%), to do assignments (97%), to prepare for

examination (86%), and to consult students' projects. Watching movies and social media sites were the least reasons for visiting the library. They often visit the library to read journals and magazines and to check students long essays or projects.

Recommendations

The following recommendations are suggested based on the findings of the study: High surveillance should be mounted on the students' projects to check for plagiarism since many students frequent the library just for that. The librarians should ensure that the undergraduates use the library for studies. With the unstable power supply of Nigeria, libraries are encouraged to have a standby generator to supplement government power supply. There is need for increase in the university's internet accessibility. The university authorities should ensure that the service they paid for is actually received. It is pertinent that the broadband be increased. Alternatively, students should have a station where they can send selected documents from the library websites for printing at a minimal cost since they are not authorized to use flash drives on the library computers.

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UNDERGRADUATE STUDENTS' ATISFACTION WITH ACCESS AND USE OF NEWSPAPERS AND MAGAZINES COLLECTIONS IN UNIVERSITY LIBRARIES IN BENUE STATE

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Abstract

The study investigated undergraduate students' satisfaction with access and use of newspapers and magazines collections in university libraries in Benue State. The study was designed to determine the extent to which undergraduate students are satisfied with access and use of newspapers and magazines in university libraries in Benue State. The design of the study is a descriptive survey. The population of this study comprises of 3,130 registered undergraduate students' of the three university libraries in the State. A total sample of 312 representing 10% of each library was used for the study using proportionate stratified sampling technique. Data was gathered through questionnaire and analyzed with the use frequencies, percentages and mean. Results shows that undergraduate students accessed and used different titles of newspapers and magazines such as tell magazine, Guardian, and the Nation newspaper. They accessed and used these resources through the assistance of the library staff, library catalogue, handwritten indexes, kardex and shelf browsing for the purposes of academic pursuit, sports, current affairs, learning, research etc. The undergraduate students are satisfied with the means of getting and using newspapers and magazines such as Guardian newspapers, Daily Sun newspapers etc in university libraries. It recommends that the libraries should make provision for online newspapers and magazines and make them accessible for undergraduate students' quick access and use.

Keywords: University libraries, students' satisfaction, undergraduate students, access and use, newspapers and magazines

Introduction

University libraries are instituted to support their parent institutions in achieving their goals viz: teaching, learning, research and community services. They are academic libraries found in universities be it federal, state or private. However, in order to support the basic function of universities, university libraries provide different kinds of resources among which are newspapers and magazines. Newspapers and magazines are primary sources of information which form the vital part of university library collections. Reitz (2004) saw it as a serial publication, usually printed on newsprint and issued daily, certain days of the week, or weekly, containing news, editorial comment, regular columns, letters to the editor, cartoons, advertising, and other items of current and often local interest to a general leadership. While some newspapers and magazines are meant for a broad spectrum of readers usually geographically defined, others focus on groups of readers and are defined more by their interests than their location. Echezona, Ugwu and Ukwoma (2009) acknowledge the benefit of newspapers that they are excellent sources when looking for current and up to date information. A magazine

on the other hand is defined by Hornby (2000) as a type of large thin book with a paper cover that you can buy every week or month, containing articles, photographs etc., often on a particular topic. They contain articles that enable one to gain an overview of the topic. They will seldom present full information on where the author found the information included.

In the context of this work, newspaper and magazines could be described as publications usually issued daily, weekly, monthly, or at other regular intervals which provides current and up-to-date news, views, entertainment among other public interest information alongside with advertisement. They provide information on local, national and world issues. They cover a broad range of topics like politics, business, fashion, filmmaking industry, current affairs and music, health, education, sports etc.

Newspapers and magazines are of different titles, sizes and volumes and they different topics, subjects or fields of study. Some are national while some are local. Some of the national newspapers and magazines include: Daily Trust, Punch, The Nation, The Voice, this Day, weekly Trust, Sunday Trust, Tell Magazine, Vanguard, newswatch etc. They either appear daily, weekly, or monthly. Newspapers and magazines are either subscribed or purchased with different prices by university libraries and each university library subscribes or acquires different titles based on their choice and the percentage of library development fund allocated and released to them. When the newspapers and magazines are acquired or subscribed to by university libraries, they are expected to be accessed and used.

Consequently, it has been observed that newspapers and magazines are hardly utilized like other library materials such as books and journals particularly in university libraries in Benue State. This calls for an investigation regarding newspapers and magazines utilization in university libraries in Benue State. This is because the universities occupy a strategic position in research and scholarship in the state and the university library seems to be better acknowledged for this purpose.

Newspapers and magazines are primary sources of information that serves different categories of university library users in different fields of human endeavour. They keep users inform on current events, entertainment, education and research among others. The use of these resources among lecturers in university libraries is as vital as utilization of other collection of library resources. This is because they are one of the sources of information in the library. However, the effective use of newspapers and magazines is highly dependent on the ability of university libraries to acquire different titles and volumes of newspapers and magazines as well as provide quality access tools to them for use by lecturers in satisfaction of their information needs. Consequently, it has been observed that newspapers and magazines may not be adequately accessed and used like other library materials by the undergraduate students of universities in Benue State. This

may affect the students' academic development leading to a situation that should not be allowed to occur now that the libraries seems to be less concern with the adopt and use Information and Communication Technology (ICT) for its provision of online resources. This may deny reports on current events and other such sensitive information that are found in newspapers and magazines. It is based on this that the study of undergraduate students' satisfaction with access and use of newspapers and magazines collections in university libraries in Benue State becomes pertinent.

Purpose of the Study

The main purpose of the study is to determine the extent to which undergraduate students are satisfied with access and use of newspapers and magazines in university libraries in Benue State. Specifically, this study sought to:

1. Identify the titles of newspapers and magazines accessed and used by undergraduate students in university libraries in Benue State.
2. Ascertain the perceived purpose of undergraduate students access and use of newspapers and magazines in the libraries
3. Examine undergraduate students sources of access to newspapers and magazines in university libraries in Benue State
4. Determine the extent to which access and use of newspapers and magazines meet the undergraduate students level' of satisfaction

Research Questions

The study was guided by the following research questions:

1. What titles of newspapers and magazines are accessed and used by undergraduate students in university libraries in Benue State?
2. What are the perceived purposes of undergraduate students' access use of newspapers and magazines in the libraries?
3. What are the undergraduate students sources of access to newspapers and magazines in university libraries in Benue State?
4. To what extent do undergraduate students' access and use of newspapers and magazines meet their level of satisfaction?

Literature Review

Newspapers and magazine publications are periodicals which are intended to be published and appear regularly. They are unique publications that contain current information and are highly significant for academic purposes such as study, teaching, learning and research (Omeje, 2014). According to Oxford shire Country Council (2015) a variety of newspapers and magazines are available for use in Oxford shire libraries. These range from a few titles at some smaller libraries to a larger collection at the Central Library in Oxford. Some local newspapers on microfilm are also available in library local history centres and the Oxfordshire history centre. Omeje (2014) identified some of the newspapers used in university libraries as The Daily Trust, The Nation,

Vanguard, The Punch, etc. Naru (1997) observed that librarians and archivists have taken keen interest in the provision and management of this important medium of information. This led information stakeholders to organize an international symposium on: access to and preservation of global newspapers held between 27th and 28th may, 1997 at Washington DC (Naru, 1997). This was aimed at defining the problems of collecting, storing, preserving and providing access to international newspapers and, most importantly, to design a course of action that will guarantee acquisition of and access to international newspapers.

University libraries provide different means of accessing library resources which newspapers and magazines are part of. According to Pen State University Libraries (2015), the University libraries provide access to newspapers, news magazines and other news content from around the world. Similarly, Campaign Country Public Library (2015) states that the Campaign Country library now offers access to Zinio for libraries, a digital newsstand that is designed specifically for library patrons. It allows patrons to read digital copies of magazines through a digital platform that recreates magazines page for-page and include embedded links to audio, video and additional resources. It gives readers access to the latest issues of magazines and an unlimited number of concurrent readers that can use the service (Campaign Country Public Library, 2015).

According to Peterson (1988), many libraries do not catalogue their newspaper holdings, but provide some other means of access by displaying titles on the shelves, by check-in records, etc. Abubakar (2009) observed that libraries regularly index all local newspapers and magazines titles to which it subscribes. This form the basis of the SDI services of the library. A previous study on the use of academic library of Olabisi Onabanjo University by Onyesiku and Oduwole (2014) revealed that reading the library newspapers is the third most important motivation after reading for examination and book consultation for doing assignments on why students visit the library. Olorunsola (1996) identified the usefulness of news magazines, as follows: a majority of the users of the news magazine collection are students, and findings revealed that users from 25 of the 47 academic departments in the University consulted the material. News magazines are a library by their own right.

According to Olorunsola (1996), “patrons have found the collection of great help in the areas of leisure/recreation, assignments, research, and current awareness. Users have a good impression of the service and staff attached to the news magazine collection. Users consult more than one news magazine, and also read more than one column in the various magazines”. In summarizing the review, the review shows that most of the literatures found on the topic are concerned with the use of newspapers while few are found on use of magazines leaving out the aspect of newspaper and magazine utilization most especially by lecturers and undergraduate students. Again, the review of literature

has shown that magazine collections which are in the same group of serials with newspapers are not given adequate attention both on the use.

Methodology

The design of the study is a descriptive survey. The population of this study comprises of 3,130 registered undergraduate students' users of the three university libraries in Benue State namely Francis Sulemanu Idachaba Library of the University of Agriculture Makurdi (Federal), Benue State University Library Makurdi (State) and Chief Ason Bur Learning Resource Centre of the University of Mkar (Private). This is categorized as 1,175 users in Francis Sulemanu Idachaba Library, University of Agriculture Makurdi; 1010 in Benue State University Library Makurdi and 945 in Chief Ason Bur Learning Resource Centre of the University of Mkar. A total sample of 312 representing 10% from each library was used for the study using proportionate stratified sampling technique. This is because Nwana cited by Uzoagulu (2011) noted that for a population size of thousands, 10% of them should be used. Data was gathered through questionnaire titled "undergraduate access and use of newspapers and magazines in university libraries in Benue state" and analyzed with the use frequencies, percentages and mean. In the analysis, the researchers considered the average percentage of 20 and above as accepted and used while any percentage below 20 is rejected and not used. On the other hand, the researchers considered average mean of 2.50 and above as highly satisfied and satisfied while any mean below 2.50 is considered as fairly satisfied as well as not satisfied and therefore not used.

Results

The results of the study are presented in tabular form and analyzed strictly in line with the four research questions that guided the study.

Table 1: Kinds of Newspapers and Magazines Titles Accessed and Used by Undergraduate Students in University Libraries in Benue State

S/N	Newspapers/Magazines Titles	Accessed	%	Not Accessed	%
1	Tell Magazine	220	99.1	02	0.9
2	The Guardian	261	96.3	10	3.7
3	The Nation	283	94.3	17	5.7
4	Newswatch	209	87.1	31	12.9
5	The Voice	180	84.9	32	15.1
6	The Daily sun	251	83.7	49	16.3
7	New Nigerian	109	81.3	25	18.6
8	Supple magazine and	02	4.6	41	9.5
9	Kick-off Nigeria	01	0.5	209	99.5

Source: Field Work 2014

Result in Table 4. 1 presents the kinds of newspapers and magazines titles that are accessed and used in university libraries in Benue State by undergraduate students. The most rated newspaper title that is provided is the Tell magazine with 220 (99.1%), guardian with 261 (96.3%). This is followed by the Nation newspaper with 283 (94.3%), Newswatch magazine with 209 (87.1%), the voice newspaper with 180 (84.9%), the daily sun newspaper with 251 (83.7%), and New Nigerian newspaper with 109 (81.3%) while the supple magazine and kick-off Nigeria are rejected with 01 (4.6%) and 01 (0.5%) respectively.

Table 2: Undergraduate Students Sources of Access to Newspapers and Magazines in University Libraries in Benue State

S/N	ITEMS	YES	%	NO	%
10	Assisted by a library staff	183	91.5	17	8.5
11	Library catalogue	260	91.2	25	8.8
12	Handwritten indexes	242	81.2	58	19.5
13	Kardex	153	76.5	27	13.5
14	Self help	79	26.5	219	73.5
15	Printed and bond indexes	43	14.7	113	72.4

Source: Field Work 2014

Table 2 is the presentation of undergraduate students' sources of access and use of newspapers and magazines in Benue State University Library, Makurdi. Result reveals that undergraduate students access and use newspapers and magazines through the assistance of the library staff with 183 (91.5%), library catalogue with 260 (91.2%), handwritten indexes with 243 (81.2%), kardex with 153 (76.5%) and shelf browsing with 79 (26.5%) while printed and bound indexes with 25 (24.03%) are rejected as means accessing newspapers and are rejected with 43 (14.7%) as their means of accessing and using newspapers and magazines in the libraries.

Table 3: Purposes for the Use of Newspapers and Magazines in Benue State University Library, Makurdi

S/N	ITEMS	YES	%	NO	%
16	Academic pursuit	200	92.2	17	1.8
17	Sports	260	90.6	27	9.4
18	Current affairs	117	78.0	33	22.0
19	Learning	120	71.9	47	28.1
20	Research	182	67.5	88	32.6
21	Health	109	66.5	55	33.5
22	Science and technology	105	51.9	97	48.0
23	Fashion	91	43.5	118	56.4
24	Recreation	53	28.5	133	71.5

Source: Field Work 2014

Results in table 4.3 reveal that undergraduate students purposes of access and use of newspapers and magazines for academic pursuit with 200 (92.2%), sports with 260 (90.6%), current affairs with 117 (78.0%), learning 120 (71.9%) research with 182 (67.5%), health with 109 (8766.5%), science and technology with 105 (51.9%), fashion with 91 (43.5%) and recreation with 53 (28.5%).

Table 4: Undergraduate Students Level of Satisfaction with Newspapers and Magazines Access in University Libraries in Benue State

S/N	Newspapers and Magazines	HS	S	FS	NS		Remark
26	Guardian	88	99	67	46	4.14	Satisfied
27	Daily Sun	157	105	17	4	3.46	Satisfied
28	New Nigerian	96	120	38	12	3.12	Satisfied
29	The Nation	133	106	3	51	3.09	Satisfied
30	The Voice	100	129	25	36	3.01	Satisfied
31	Tell	85	127	46	11	2.85	Satisfied
32	Newswatch	100	93	6	10	2.63	Satisfied
33	Newsletter	57	116	31	90	2.42	Satisfied
34	Supple magazine and	0	44	56	91	1.74	Not Satisfied
35	Kick-off Nigeria	05	7	97	74	1.68	Not satisfied

KEY: HS= Highly Satisfied, S=satisfied, FS=Fairly Satisfied, NS=Not Satisfied
Source: Field Work 2014

Table 4.4 presents undergraduate students' level of satisfaction with access to newspapers and magazines in university libraries in Benue State. Their responses indicates that undergraduate students are satisfied with the use of Guardian newspapers a mean of 4.14, Daily Sun with 3.46, New Nigerian with 3.12, the Nation with 3.09, the Voice with 3.01, Tell with 2.85, Newswatch with 2.63 respectively while undergraduate students are not satisfied with access to and use of Newsletter with 2.42, supple Magazine with 1.74 and Kick-off Nigeria with 1.64.

Discussion

Newspapers and magazines contain information that needs to be accessed and used for different purposes. University libraries in recognition of the importance of newspapers and magazines collections, choose among many titles available in the market, acquire and make them accessible for use by the general public. In university libraries in Benue State, different titles of newspapers and magazines are provided, accessed and used by the undergraduate students. These include the Tell magazine, Guardian, the Nation newspaper, Newswatch magazine, the voice newspaper, the daily sun newspaper and New Nigerian newspaper. This rhymes with Omeje (2014) who identified some of the

newspapers used in university libraries as the Daily Trust, the Nation, Vanguard and the Punch.

University libraries provide different means of accessing newspapers and magazines collections for use by undergraduate students in to use them. Findings of the study reveals that the undergraduate students' of the institutions access and use newspapers and magazines through the assistance of the library staff, library catalogue, handwritten indexes, kardex and shelf browsing. This agreed with Pen State University Libraries (2015) which informs that the University libraries provide access to newspapers, news magazines and other news content from around the world.

Newspapers and magazines are primary sources of information that are used for different reasons by different people. The undergraduate students of university libraries in Benue State as revealed by the study accessed and used it for academic pursuit, sports, current affairs, learning research, health as well as science and technology. This is in line with Olorunsola (1996) who reported that patrons have found the collection useful for the purposes of leisure/recreation, assignments, research, and current awareness.

Newspapers and magazines are not just accessed and used; they are accessed and used to satisfy an information need. Results shows that undergraduate students of university libraries in Benue State are satisfied with the use of Guardian newspapers, Daily Sun, New Nigerian, the Nation, the Voice, Tell magazine and the Newswatch magazine. This finding also support Olorunsola (1996) who reveals that patrons have found the collection of great help in the areas of leisure/recreation, assignments, research, and current awareness and have a good impression of the service and staff attached to the news magazine collection.

Conclusion

From the data emanating from this study, it is evident to articulate that undergraduate students accessed and used different titles of newspapers and magazines such as Tell magazine, Guardian, and the Nation newspaper. They accessed and used these resources through the assistance of the library staff, library catalogue, handwritten indexes, kardex and shelf browsing for the purposes of academic pursuit, sports, current affairs, learning, research etc. The undergraduate students are satisfied with the means of getting and using newspapers and magazines such as Guardian newspapers, Daily Sun newspapers etc in university libraries

Recommendations

Based on the results of the study, the following recommendations are made:

Newspapers and magazines titles should also be provided and made accessible by the libraries digitally. Provision be made to access and use newspapers and magazines electronically to save the users time in the libraries. Undergraduate students should also use newspapers and magazines for historical purposes as they are also good sources of

history. Undergraduate students should also continue to access and use newspapers and magazines in universities to satisfy their information needs

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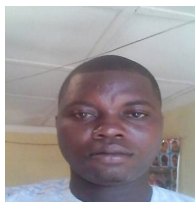
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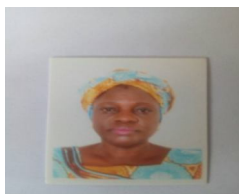
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USERS' SATISFACTION AND UTILISATION OF INTERNET RESOURCES AT THE UNIVERSITY LIBRARIES IN NORTH EAST ZONE, NIGERIA

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Abstract

This study investigated users' satisfaction and the Utilisation of Internet resources at the University Libraries in North East Zone, Nigeria. Five universities were adopted. A survey design of correlational type was used to determine the relationship between users' satisfaction and utilisation of internet resources at the university Libraries in North East Zone, Nigeria. Stratified random sampling technique was used in drawing the samples for this study. The research instrument used for this study was self-developed questionnaire. Data collected were analysed using descriptive statistics to answer the two research questions while inferential statistics of Chi-square was used to test the formulated null hypothesis using the Pearson Product Moment Correlation Coefficient at 0.05 level of significance. The results showed that there was significant relationship between users' satisfaction and utilisation of internet resources in university libraries in North East Zone, Nigeria. The study concluded that with users' satisfaction significantly correlate with utilisation of internet resources and thus users are moderately satisfied. The study recommended that university libraries in North East Zone, Nigeria should have good internet connectivity and internet websites so as to integrate ICT in teaching, learning, research, library information and management services for users to be satisfied.

Keywords: Internet, Utilisation, Satisfaction, University Libraries, North East.

Introduction

Internet is an important and major source of information and a medium through which communication, dissemination and storage of information are facilitated. Shitta (2002) posited that Internet is a communication super highway that links, hooks and focuses the entire world into a global village, where people of all races can easily get in touch, see, or speak to one another and exchange information from one point of the globe to another. Huchison and Sayer (2000) defined the Internet as the "worldwide publicly accessible network of interconnected computer networks that transmit data by packed

switching using the standard Internet protocol (IP)". This network consist of millions of smaller domestic, academic, business and government networks which together carry various information and services such as electronic mail, online chat, file transfer and the interlink web pages and other documents of the world wide web (Capron., 2000). The Internet helps provides links to remote information and resources around the world (Ibegwam, 2002).

Utilisation of internet in university libraries has no doubt provided users with opportunity to access variety of information to satisfy their needs. It has also, minimizes time spent searching for relevant and current information, minimizes difficulty encountered and allows multiple accesses that were hitherto impossible. Internet also enhances teaching, learning and research needs of patrons (Adomi, Omodeko and Otolu, 2004).Users' satisfaction has however, been described as a sense of contentment that arises from an actual experience in relation to an expected experience by users (Hernon and Whitman 2001). It is a judgment that a service provides (or is providing) a pleasurable level of consumption. Satisfaction with library resources and services is therefore, a feeling of fulfillment that is derived from the use of library services. Studies have revealed that users derived a lot of benefits from internet utilisation to a wider range of information and improved academic performance as a result of access to quality information (Okello-Obura and Magara, 2008). Oyedun (2007) conducted a study on the Internet use in the Library of Federal University of Technology, Minna, and observed that most of the respondents claimed that through the Internet services in the library, they have improved considerably in their academic performance. Users' satisfaction therefore, could be viewed as the extent to which library services and resources meet the information needs and demands of library users. University libraries should serve its users at any point in time and must be able to give quality electronic information service to meet and satisfy the information needs of its users.

Studies have shown that many universities have devoted huge amount of fund in an effort to acquire and connect internet but which appeared underutilised by the users of such universities, with the consequent effects of making the users dissatisfied. This prompted the researchers of this study to assess the relationship between utilisation of internet and users' satisfaction in university Libraries in North East Zone, Nigeria.

The need for Nigerian university libraries to perform their functions of supporting teaching, learning and research activities, requires the adoption and utilisation of internet to satisfy the users quest for information and advancement of knowledge. Igun (2005) observed that academic institutions cannot do without Internet services especially in this era of information globalization, explosion and superhighway. The Internet is acknowledged globally as a technology dominated by young people, and

particularly students who are more inclined to exploit Internet resources for education, social interaction and entertainment (Salako & Tihamiyu, 2007).

Preliminary investigation conducted by the researchers in university libraries in North East Zone, Nigeria revealed that, the university libraries understudy are connected to the internet, but, the library users are yet to fully explore the opportunity that abounds through this media as it appeared underutilised due to perhaps lack of users' awareness on the availability, lack of skills, poor electricity supply, among others. This therefore creates some doubt on whether or not the internet facilities in these university libraries are being utilised for the satisfaction of users or not. It is against this background that the researchers investigated the utilisation of internet and users' satisfaction in university libraries in North East Zone, Nigeria.

Objective of the Study

The objectives of the study were to determine the:

1. Relationship between internet utilisation and users' satisfaction with information resources in university libraries in North East Zone, Nigeria.
2. Extent of users' internet utilisation in university libraries in North East Zone, Nigeria.
3. Extent of users' satisfaction with internet utilisation in university libraries in North East Zone, Nigeria.

Research Questions

The following research questions guided the study.

1. What is the extent of users' internet utilisation in university libraries in North East Zone, Nigeria?
2. What is the extent of users' satisfaction with internet utilisation in university libraries in North East Zone, Nigeria?

Hypothesis

The following null-hypothesis was tested at 0.05 level of significance:

H₀₁- There is no significant relationship between utilisation of internet and users' satisfaction.

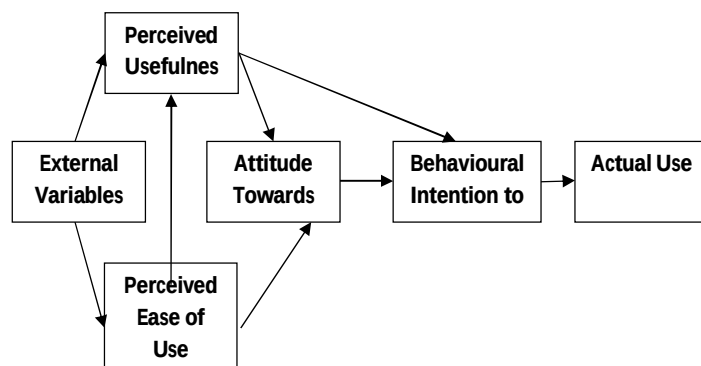
The findings of this study will be useful to university libraries in North East Zone, Nigeria and it will be significant to both academic staff and students of the universities under study. The findings of this research will be of great benefit to university libraries in North East Zone, Nigeria, because it will reveal the relationship between utilisation

of electronic information resources and users' satisfaction in these libraries under study. The study will be significant to students in the area of research and learning because, it will create awareness to the students on the availability, and existence of e-resources. The findings of the study will be significant to academic staff and researchers of the universities under study in that they will use the e-resources to access information useful for conducting research, publications and teaching.

Review of Literature

Theoretical Framework

This study adopted the Technology Acceptance Model (TAM) developed by Davis (1989). The model was developed to explain computer-usage behavior. It models how users accept and use new technology. The model suggests that when library and users are presented with a new technology, a number of factors influence their decision about how and when they will use it. Such factors include: Perceived usefulness (PU) - This was defined by Davis (1989) as the degree to which a person believes that using a particular system or structure would enhance his or her job performance. Perceived ease-of-use (PEOU) - Davis defined this as the degree to which a person believes that using a particular system would be free from effort (Davis 1989). In the context of information technologies, TAM suggests that users formulate a positive attitude toward a particular technology when they perceived that the technology is useful and easy to use (Davis 1989)



Source: Technology Acceptance Model (TAM) (Davis, 1989)

Researchers have replicated TAM model in their studies. Alshare and Alkhateeb (2008) used TAM to predict Internet usage in Chile and United Arab Emirates which are both developing countries like Nigeria. The researcher's variables included Internet availability and Internet usage and their moderating role in the relationship between

perceived ease of use (PEOU) and perceived usefulness (PU). The study found that PU was the only significant predictor of Internet utilisation. Also, Hinson (2011) used TAM to determine the Internet browsing behaviour of executive postgraduate students of the University of Ghana, Business School. Study reported students browsing the Internet for social, professional and academic purposes. Among some of the activities students performed on the Internet included sending and receiving e-mails, utilisation of social networks, searching for information on trade, interaction, access of client databases, research, access to academic journal databases, and interacting with lecturers and supervisors.

In the same vein, this model is relevant to this study, because, the model reveals the factors that influence one's attitudes towards acceptability or otherwise of a particular technology to include: perceived usefulness and perceived ease-of-use. As such, the perceived usefulness of internet is influenced by the level of satisfaction users of university libraries drive from utilisation of internet. Satisfying users' information needs is the primary responsibility of university libraries through the acquisition of internet and other facilities, and making them available for utilisation of library users. When the users information needs are met with the internet in the library, satisfaction will occur. On the perceived ease-of-use, internet has brought users an opportunity to access information without any difficulty, less time is now used in accessing information and the main thrust for utilisation of internet is to save the time of the users' with less efforts that were hitherto impossible.

Internet Utilisation and Users' Satisfaction in University Libraries

Internet connectivity enhances teaching, learning and research needs of patrons (Adomi, Omodeko and Otolu, 2004). It allows users to access vast quantities of information and communication with everyone around the world (Eyitayo, 2008). The author further added that this has become the most popular way of locating and retrieving information. Staff and students in academic community enjoy Internet as a result of the facilities it offers as noted by Islam and Islam (2007) in Anunobi (2006) to include; e-mailing, audio broadcasting, telex/video conference, World Wide Web browsing, telephoning, news and discussion/chart group facilities, e-books storing. Internet as affirmed by Awolaye, Siyanbola and Oladapo (2008), is used for information development, enhances easy communication, improves academic performance, used as a researched tool, provides solution to assignments, gives information on entertainment & education, and a source of scholarship.

Kaur (2008) surveyed the use of Internet facility at the Guru Nanak Dev. University, Amritsar. The findings revealed that all respondents used search engines to browse the required information and majority faced the problem of slow Internet connectivity. The result of the study further indicated that more than two-third of the respondents confirmed Internet were time saving, easy to use, more informative and more preferred.

Okello-Obura and Magara (2008) investigated electronic information access and utilisation at the East African School of Library and Information Science, Makerere University, Uganda. Out of the 250 targeted students, 190 responded, giving a response rate of 76% used the internet. The study revealed that users derived a lot of benefits from electronic resources gaining access to a wider range of information and improved academic performance as a result of access to quality information. Similarly, a survey conducted by Kwafoa, Imoro and Afful-Arthur (2014) on assessment of the use of electronic resources among administrators and faculty in the University of Cape Coast revealed that all the faculty members had some level of knowledge and experience when it comes to internet usage. The result showed that as high as 49.56% of the respondents used the internet for academic work, while 4.35% used it for official or clerical work such as e-mailing and visiting other social networking sites.

Oyedun (2007) conducted a study on the Internet use in the Library of Federal University of Technology, Minna, and observed that most of the respondents claimed that through the Internet services in the library, they have improved considerably in their academic performance. Also, Salako and Tiamiyu (2007) surveyed the use of search engines for research by postgraduate students of the University of Ibadan, Nigeria. Copies of 327 questionnaire were analysed and it was found that most of the responding postgraduate students were aware of, and had become familiar with the Internet before the start of their postgraduate courses on how they learnt to use search engine. According to Lawal (2013), 94% of final year students at Covenant University indicated that the internet had greater impact on their projects. Nwezeh (2010) in a study on the use of ICT in Nigerian Universities found that 78% of staff and 85% of students at Obafemi Awolowo University use the internet for their projects. Another study conducted by Adeniran (2013) on the usage of electronic resources by undergraduates at the Redeemer's University, Nigeria shows that 90 (73.2%) of the respondents used the internet regularly, 66 (36.9%) used it occasionally, 43 (7.8%) used it rarely while 57 (13.3%) indicated that they did not use it.

Similarly, a study conducted by Lawal (2013) on the use of information and communication technology (ICT) in Covenant University Library Ota, Nigeria indicated that both students and faculty use all the resources at the covenant university library. The faculty respondents indicated internet usage in the library with a frequency of 28 representing 56% while the student respondents indicated internet usage with a frequency of 130 representing 56.5%. The study further reveals reasons for using the internet by both faculty and students. The faculty respondents, with the highest frequency of 40 representing (80%) use the internet in the library to up-date knowledge, while the highest students respondents 177 (76.96%) use the internet to complete project. This is followed by 35 (60%) of the faculty respondents use the internet for communication, while, 150 (65%) students respondents use the internet to browse the web.

Methodology

This study adopted survey design of correlational type to determine the relationship between utilisation of internet and users' satisfaction in university Libraries in North East Zone, Nigeria. Five (5) University Libraries were sampled and they included University of Maiduguri, Abubakar Tafawa Balewa University Bauchi, Adamawa State University Mubi, Gombe State University Gombe, and American University of Nigeria Yola. Stratified random sampling technique was used in drawing the samples for this study. The research instrument used for this study was self-developed questionnaire. Data collected were analysed using descriptive statistics to answer the two research questions, while, inferential statistics of Chi-square was used to test the formulated null hypothesis using the Pearson Product Moment Correlation Coefficient at 0.05 level of significance.

Data Presentation and Results

One thousand, two hundred and sixty four (1,264) copies of the questionnaire were distributed, filled and returned from the university libraries under study. The entire copies of the questionnaire administered were filled, returned and found usable, making 100% return rate. The high response rate could be attributed to the fact that the respondents were all educated and the research assistants co-opted were all professionals working in the university libraries under study and were able to persuade the respondents in filling the copies of the questionnaire on wait and collect basis. Also, of the 1,264 respondents that participated in this study, 266(21.0%) were between the ages of 17-24, 331(26.2%) were between the ages of 25-34, 353(27.9%) were between the of ages of 35-44, 314(24.9%) were between the of ages 45 years and above, University of Maiduguri recorded 226(17.9%) response, Abubakar Tafawa Balewa University recorded 302(23.9%) response, Adamawa State University recorded 254(20.1%) response, Gombe State University recorded 265(21.0%) response, American University of Nigeria recorded 217(17.1%) response. There were 3239(25.6%) non degree students were sampled, 338(26.7%) undergraduate students were sampled, 267(21.1%) postgraduate students and 336(26.6%) academic staff were sampled of which 832(65.8%) were males and 432(34.2%) were females making a total number of 1,264 respondents.

Research Question One: What is the extent of users' utilisation of Internet resources?

Table 1: Extent of Users' Utilisation of Internet resources in University Libraries

	Utilisation of Internet	High 4	Moderate 3	Low 2	Very Low 1
1	What is the extent of your utilisation of internet for information?	373(29.5%)	412(32.6%)	330(26.1%)	149(11.8%)
2	What is the extent of your utilisation of internet for research and learning?	471(37.3%)	541(42.8%)	220(17.4%)	110(8.7%)
3	What is the extent of your utilisation of internet for sending and receiving e-mails?	316(25.0%)	621(49.1)	211(16.7%)	116(9.2%)
4	What is the extent of your utilisation of internet for social networking and teaching?	315(24.9)	521(41.2)	217(17.2%)	211(16.7%)

Source: Field Survey

Table 1 shows the extent of users' utilisation of internet. Under the extent of utilisation of internet for information, high recorded 373(29.5%), moderate recorded 412(32.6%), low recorded 330(26.1%) and very low recorded 149(11.8%). Under the extent of users utilisation of internet for research and learning high, recorded 471(37.3%), moderate recorded 541(42.8%), low recorded 220(17.4%) and very low recorded 110(8.7%). Under the extent of utilisation of internet for sending and receiving e-mails, high recorded 316(25.0%), moderate recorded 621(49.1%), low recorded 211(16.7%) and very low recorded 116(9.2%). Under the extent of users utilisation of internet for social networking and teaching high recorded 315(24.9%), moderate recorded 521(41.2%), low recorded 217(17.2%) and very low recorded 211(16.7%).

Research Question Two: What is the extent of users' satisfaction with utilisation of Internet resources?

Table 2: Extent of Users' Satisfaction with Utilisation of Internet Resources

	Satisfaction with utilisation of Internet	High 4	Moderate 3	Low 2	Very Low 1
1	What is the extent of your satisfaction with utilisation of	366(28.9%)	551(43.6%)	223(17.6%)	124(9.8%)

internet for information?

2	What is the extent of your satisfaction with utilisation of internet for research and learning?	236(18.7%)	201(15.9%)	574(45.4%)	253(20.0)
3	What is the extent of your satisfaction with utilisation of internet for sending and receiving messages?	423(33.5%)	415(32.9%)	321(25.4%)	105(8.3%)
4	What is the extent of your satisfaction with utilisation of internet for social networking?	550(43.5%)	490(38.8%)	160(12.7%)	64(5.1%)

Source: Field Survey

Table 2 shows the extent of users' satisfaction with utilisation of Internet resources in the study area. Under the extent of users' satisfaction with utilisation of internet for information, high recorded 421(33.3%), moderate recorded 423(33.5%), low recorded 299(18.1%) and very low recorded 191(15.1%). Under the extent of users' satisfaction with utilisation of internet for research and learning, high recorded 366(28.9%), moderate recorded 551(43.6%), low recorded 223(17.6%) and very low recorded 124(9.8%). Under the extent of users' satisfaction with utilisation of internet for sending and receiving messages, high recorded 236(18.7%), moderate recorded 201(15.9%), low recorded 574(45.9%) and very low recorded 253(20.0%). Under the extent of users' satisfaction with utilisation of internet for social networking, high recorded 423(33.5%), moderate recorded 415(32.9%), low recorded 321(25.4%) and very low recorded 64(5.1%).

Hypothesis Testing

Hypothesis was tested in this section using the Pearson Product Moment Correlation Coefficient at 0.05 level of significance.

Table 3: Relationship between Utilisation of Internet and Users' Satisfaction
N = 1,264

Variable r	Utilisation of	P-value	Users E-journals	satisfaction
Utilisation of Internet	0.144**		0.000	
Users' satisfaction				

**. Correlation is significant at 0.05 level (2-tailed), ($p < 0.05$)

The result in table 3 shows that there is a significant relationship between utilisation of internet and users' satisfaction. This is because the probability value ($P = 0.000$) is less than critical value at 0.05 level of significance ($P < 0.05$) at a correlation index $r = (0.144)$, meaning that utilisation of internet in university libraries in North East Zone, Nigeria is significantly related to users' satisfaction. Hence, the null-hypothesis which states that there is no significant relationship between utilisation of internet and users' satisfaction is rejected.

Discussion

This study investigated the relationship between utilisation of internet and users' satisfaction in university libraries in North East Zone, Nigeria. Research question one sought to find out the extent of users utilisation of internet in University Libraries in North-East Zone Nigeria. The study found that the users' utilisation of internet in these libraries was moderate. This is in line with the study by a study conducted by Adeniran (2013) on the usage of electronic resources by undergraduates at the Redeemer's University, Nigeria which shows that majority of the respondents used the internet regularly. Also, Okello-Obura and Magara (2008) investigated electronic information access and utilisation at the East African School of Library and Information Science, Makerere University, Uganda revealed that majority (76%) of respondents used the internet. Research question two sought to find out the extent of users satisfaction with users utilisation of internet in University Libraries in North-East Zone Nigeria. The result showed that the extent of users' satisfaction with utilisation of internet was moderate. This finding agrees with the finding of Mirza and Mahmud (2012) which revealed that users of Pakistani University libraries are moderately satisfied with the information they obtained from e-resources. Bansode (2013) also agreed with this finding as he found that majority of the respondents admits that their information requirement are moderately satisfied with the e-resources subscribed by their library.

Pearson Product Moment Correlation (PPMC) Coefficient was used to test the null-hypothesis. The result of hypothesis tested revealed that there was significant relationship between utilisation of internet and users' satisfaction in University libraries in North East Zone, Nigeria. In line with this finding, is the study by Adomi, Omodeko and Otolu (2004) which confirmed that Internet connectivity enhances teaching, studying, research, publishing and communication among University library users which is mostly constituted by academic staff and students of institutions. Igun (2005) agrees with these findings, his study reported on utilisation of internet services among university library users, according to Igun, internet services had become indispensable for academic institutions, especially in this era of information globalization, explosion and superhighway. Eyitayo (2008) on the other hand, enumerated how internet services had become the most popular way of locating and retrieving information. The internet proves very useful by allowing users to access vast quantities of information and

communication with everyone around the world. Commenting on the importance of the Internet facility, Ojo-Igbinoba (1997) as cited by Owolabi (2007) stated that Internet had become the market place for learning and online education. Stressing this point Ojedokun (2001) pointed out that Internet had broken down barriers of communication and information access from anywhere in the world. Ojedokun maintained that the Internet allows users to have access to up-to-date research publications in the net. Also agreeing with this result is Kaur (2008) who surveyed the use of Internet facility at the Guru Nanak Dev. University, Amritsar and found that more than two-third of the respondents confirmed using the internet due to its time saving, easy to use, fast and efficient method of data processing. Staff and students in academic community enjoy Internet as a result of the facilities it offers. Awoleye, Siyanbola and Oladapo (2008) affirmed that internet is used for information development, enhances easy communication, improves academic performance, used as a research tool, provides solution to assignments, gives information on entertainment and education, and a source of scholarship.

However, contrary to the findings of this study, Kumar and Kaur (2005) reported major problems faced by the users of internet in the Engineering Colleges of Punjab, India. Outstanding among them were slow access speed of the Internet and cost. Similarly, Emejo (2009) reported that about 70 percent of Nigeria's Internet capacity has been disrupted following a reported damage of one of the landing cables of Satellite 3 (SAT3) submarine system. This incident has according to him caused "temporary setback" to the nation's data market. This is the cause of the network outage being experienced by large number of Internet subscribers in the country. The finding of Akande (2004) also deviates from the findings of the hypothesis. The author revealed that, among others, the recorded low level of utilisation of internet was attributed to the low level of connectivity and the high cost of cybercafé facilities. Emojorho (2010) is a study on ICT and collection management in public libraries found that only few public libraries in the South-South, Nigeria are computerized and do not make use of internet, moreover, they are not adequately funded, computers are not available and the libraries lack developed manpower.

Conclusion

It is concluded that even though internet resources are available in the university libraries under study, the extent of library users' utilisation of internet and the extent of users' satisfaction with utilisation of internet for research and learning, information, sending mails and social networking is generally moderate. Similarly, utilisation of internet significantly correlated with users' satisfaction and thus users are moderately satisfied

Recommendation

On this note, all university libraries in North East Zone, Nigeria should have good internet connectivity and internet websites so as to integrate ICT in teaching, learning, research, library information and management services. This will enable staff to use the e-library, and those with Personal Computers (PCs) that are connected to the internet from their offices to access the internet. This will go a long way in satisfying the demand for information by users of the university libraries under study.

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EFFECT OF INSTRUCTIONAL MEDIA ON THE ACADEMIC ACHIEVEMENT OF STUDENTS IN SOCIAL STUDIES IN JUNIOR SECONDARY SCHOOLS IN ONDO STATE, NIGERIA

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Abstract

The study provides justification for investigating the effect of the use of instructional media in the learning of social studies in Junior Secondary Schools, using a pretest-posttest quasi experimental design. A sample of one hundred (100) students selected using simple random sampling technique from secondary schools in Akure South Local Government of Ondo State represents the sample in the study. The researcher developed and validated an achievement test (SSAT) which was the main instrument used for data collection. T-test statistical tool was used for data analysis. The result of the finding revealed that students exposed to the teaching of social studies using instructional media performed significantly better than those taught social studies without instructional media and that the gender of the students have no effect on the academic achievement when taught social studies with instructional media. The implications of the study were consequently discussed.

Keywords: *Instructional media, Academic achievement, Junior secondary school students, Junior secondary school.*

Introduction

Social studies as a school subject has over the year occupied an important position in the school curriculum. The subject has been recognized as effective tool for citizenship education in Nigeria. It is also a subject that equips the learners with critical and problem solving skills which enable them to tackle problems and issues that may arise in their socio-economic life. As a result of this, the Federal Ministry of Education in Nigeria categorized social studies as one of the core subjects in Junior Secondary School curriculum (National Policy on Education 2004).

More specifically the Federal Ministry of Education's (2007) nine year basic education curriculum for social studies has overall objectives of enabling primary and junior secondary school pupils and students achieve the following objectives: develop the ability to adapt to changing environment; become responsible and disciplined individuals capable of and willing to contribute to the development of their societies inculcate the right types of values ; have compassion for other people, appreciate their culture, history and those foundational factors that make them human; develop the capability to recognize the many dimensions of being human in different cultural and social contexts; develop a sense of solidarity and sharing based on a sense of security in one's own identity.

Ikem and Daniel (2012) contend that social studies in school curriculum should help students at all levels to develop the ability to adapt to the ever changing environment. Akintunde (2004) and Oyibe (2011) also argue that since social studies is interested in everything about man, in relation to all aspects of his environment; the subject incorporates all aspects of reforms and innovations geared towards the sustenance of man's environment in related study. Abdu-Raheem (2014) asserted that social studies enable man learn about the problem of survival in their environment. He argues further that it enable man to be a functional member of the society and useful to himself or herself as well as community at large.

In spite of the laudable objectives and benefits of social studies in the school curriculum, the teaching of the subject is characterized with conventional method of teaching which always lead to ineffective learning and poor attitude of students towards the subject (Adelekan, 2010). Several measures have been recommended to improve students' attitude and academic achievement in secondary school subject. Among the measures recommended are appropriate use of teaching methods, instructional media and resources (Aremu & Okuntade, 2010). However, research has also proved that facilitative potentials of instructional media can enhance students' academic achievement and also enrich classroom instruction (Osulor, 2009; Afuwape 2004).

The foundation for the use of instructional media in the school system is to transmit information in the teaching and learning process. Instructional media according to Orungbemi (2008) refers to a broad range of information carrying resources that constitute and integral component of classroom teaching and learning, and are utilized in an instructional process with the hope of facilitating effective and efficient communication in the teaching and learning process. That is instructional media are those materials or objects that help the teacher in making the lesson more interesting on the learners.

Orungbemi (2008) and Abimbade (1997) reported that using instructional media in teaching and learning make students learn more and retain better what they have been

taught and that it also promotes and sustains students' interests; it also allows the learners to discover themselves and their abilities. Instructional media enrich learner's knowledge and reinforce verbal instruction (Olibie 2008; Ajelabi 2000). In other words, when instructional media are used, there is tendency to make classroom environment lively and interesting.

There are several types of instructional media, depending on what to teach, where to teach and the availability of instructional media in that environment. According to Olibie (2008) and Abimbade (1997), instructional media can be classified into three categories. These are non-print media, print media and electronic media. The non-printed media are projected materials such as films, slides, film-strips while printed materials are books, text, map, journals and electronic media consists of visual, audio and audio-visual that relies on electricity to function effectively. All these and many more stimulate a sense of observation in learners.

The issue of gender in education has been a recurring decimal in research. As indicated in the Nigeria blue prints on women education (1977-1981). Several factors affect female participation in technology. That is female students often run away from science and technological subjects because of the social pressure and potential attitude of female role models. This tendency has been noticed from secondary schools. Both girls and boys feel that teachers, counselor and parents perceive science subjects especially technology as male oriented field course.

Olayinka (2016) highlighted the contribution of instructional materials to the academic achievement of secondary school students in Social Studies in Ekiti State. The population for the study comprised of all Junior Secondary School Class II students from among which 180 were sampled. The instrument for the study is a 30 multiple-choice self- designed Social Studies Achievement Test (SSAT).The instrument was validated by specialists in Social Studies Test and Measurement and Educational Management. Test-re-test method and estimation of internal consistency was used to ascertain the reliability. The reliability co-efficients of 0.73 and 0.75 were obtained respectively. The study generated four hypotheses that were tested at the significance level of 0.05. ANOVA and ANCOVA statistical tools were used to analyse the data collected. The study found that there was a significant difference in the pre-test and post-test of students in the experimental group. The study also found that gender effect was not statistically significant in social studies. The study concluded that students who were taught with instructional materials performed better than those taught without. The study therefore recommended that teachers of Social Studies should employ the use of essential instructional materials for their teaching and also improvise where and when the materials are not available. It therefore becomes imperative to have concerted efforts among parents, school and the government to make available important and necessary

instructional materials to teachers of Social Studies for enhanced teaching and consequents improved achievement of students in the subject.

Chukwuemeka (2014) evaluated the implementation of the Social Studies Curriculum in Junior Secondary Schools in Enugu State. Out of the six educational zones in Enugu State namely, Agbani, Awgu, Enugu, Nsukka, Obollo-Afor and Udi, Nsukka educational zone was selected for the study. Using proportionate stratified random sampling techniques, 25 social studies teachers in 20 schools in the educational zone were selected. Structure Systematic Observation Schedule (SSOS) and Social Studies Evaluation Questionnaire (SSEQ) were used for data collection. Data collection comprised of 25 teachers used for observation while 200 teachers were given questionnaires. Therefore, a total of 225 teachers formed the sample of the study. The data were analysed using mean as standard deviation to find out the responses of social studies teachers. Results from the study showed that level of qualification made a difference in the teachers who teach social studies and most importantly on the Implementation of Social Studies Curriculum in Junior Secondary Schools. Social studies teachers employed discussion, discovery, problem-solving, inquiry and expository method while teaching. The teachers employed the students' activities in the curriculum, geared towards critical reflective thinking that is learner based while most students have many other things to do, either in the school or outside the school which cause them to get easily distracted from their school work. Based on the findings, recommendations were made which included that government should organize workshops and seminars to re-train teachers in proper implementation of the social studies curriculum in Junior Secondary Schools and that social studies teachers should endeavour to use learner centered strategies like students activities in teaching and learning so that students will contribute in the process and thus make learning more concrete.

Oshokoya (2007) determined the effect of videotaped instruction in the teaching of history. The study adopted the quasi-experimental research design using video-taped instruction & conventional strategies. A multi-stage sampling technique was employed to select 92 history students made up of 40 males and 52 females. A validated history achievement test instrument with a reliability coefficient of 0.75 was administered. The result showed that students taught with video-taped instruction performed better ($x=25.30$) than those taught with the conventional method ($x=20.12$). The result of the ANCOVA statistical analysis revealed that gender $F(2,91) : p > 0.05$ was not a significant factor on students' achievement in history, when video-taped instructions are used. The mean achievement scores of both male and female students were greatly improved on the use of video-taped instruction establishing that the use of video-taped instruction is independent of gender.

Furthermore, studies have shown the facilitative roles of instructional media in learning, but most of these studies are in other school subject apart from social studies (Scott, 2015; Chukwuemeka, 2014, Friesen & Scott, 2013). Social Studies, being a relatively new subject in the curriculum of Nigerian secondary schools, not much had been reported about the effectiveness of media in its teaching and learning. Furthermore, most teachers assume that social studies do not require any other illustrate device. Similarly, Akinleye (2010) attested that effective teaching and learning requires a teacher to teach the students with instructional materials and use practical activities to make learning more vivid, logical, realistic and pragmatic. Abdu-Raheem and Oluwagbohunmi (2015) agreed that instructional materials are indispensable to the effective teaching and learning activities. Ekpo (2004) and Oluwagbohunmi and Abdu-Raheem (2014) also supported that teaching aids are always useful in supporting the sense organs. Despite the fact that instructional materials are essential tools that can make learning practical and knowledge acquisition easier, they are not readily available in Nigerian secondary schools leading to low level of performance of learners in government examinations (Abdu-Raheem 2014). The researchers considered all of these necessary to be verified. It is on this note that the study examined the effect of instructional media on the academic achievement of students in social studies in junior secondary schools.

Objectives of the Study

The main objective of the study was to examine the effect of instructional media on the academic achievement of students in social studies in junior secondary schools. The specific objectives of the study were to:

1. determine the significant difference in the mean achievement scores of students taught social studies using instructional media and those taught social studies without instructional media.
2. examine the significant difference in the mean achievement scores of male and female students taught social studies using instructional media.

Research Hypotheses

Two research hypotheses were formulated and tested at 0.05 level of significance. They are:

1. There is no significant difference in the mean achievement scores of students taught social studies using instructional media and those taught social studies without instructional media.
2. There is no significant difference in the mean achievement scores of male and female students taught social studies using instructional media.

Methodology

In this study, pretest post- test, control group quasi experimental design was used with one experimental group (instructional media) and one control group (without instructional media).

Population of the Study

The population for this study consisted of the entire Junior Secondary social studies students in Akure South Local Government Area of Ondo State.

Sample and Sampling Technique

A total of 100 students selected through simple random sampling technique from two Junior secondary schools in Akure South Local Government Area of Ondo State represent the sample for the study. The two schools are:

1. Schools offering social studies in Junior Secondary School.
2. Having at least two university graduate teachers in social studies JSS 2 arms/class was used in the study.

Instrument

Three instruments were developed and used in this study. They are:

Social Studies Achievement Test (SSAT): This is a twenty items multiple choice items with four response format. The instrument had two sections, Section A and B. Section A comprised the personal data of the participants while Section B is made up of twenty items covering selected concepts taught during the lesson. These concepts include meaning of mineral resources, types, uses, and location of mineral resources in Nigeria. The score of the respondents in the test represent the academic achievement score used in the study.

Operation Guide: This was a guide of discussion for use of the teachers in both experimental and control groups. The researcher drew the chart of types and locations of mineral resources in Nigeria on transparent paper and projects it for the class in the experimental group. The purpose was to expose them to the contents which later formed the items of the test they were given thereafter to determine their academic achievement.

Instructional Media: This consists of media resources used in the treatment of the experimental group. It consists of the instructional charts and projected material. The instructional media was used to teach the contents of the subject. This was to be able to determine whether students taught social studies content with the instructional media perform better in the achievement test than those that were not taught using the instructional media.

Validation of Research Instrument

The social studies achievement test was given to experts in social studies and other related field to help establishing the face and content validities of the instrument. Consequent upon this, some items in the test were modified while others were removed and substituted. The test was trial tested among twenty students from secondary schools not participated in the study. Through Split-half method, the reliability yielded a correlation coefficient of $r = 0.89$ which was high enough and indicated the test to be reliable.

Research Procedure

The procedure was in three faces, the first face include the training of the participating teachers. Before the commencement of the research work, the researcher trained the teachers in both experimental and control group. This is to enable the participating teachers to be proficient in their assigned roles and also acquire all the necessary skills to enable them use the operational guide of instruction in both experimental and control groups. The teachers in experimental group make use of instructional medial package prepared for experimental groups.

The first week of experiment was used to conduct the pretest in order to determine comparability of group. The groups were found to be comparable based on the mean test scores. In the second face, the students in the experimental group were taught social studies using instructional media to explain some concepts in social studies, such as the meaning of mineral resources, types and location of minerals resources as well as uses of mineral resources in Nigeria. While the control group was taught some concept in social studies without instructional medial, this lasted for six weeks.

Phase III: The social studies achievement test was administered as a post test for students in the experimental and control groups.

Data Analysis and Results

The data from the study were analyzed using t-test statistics. The results of the study are presented in the following table.

Hypothesis 1: There is no significant difference in the mean achievement scores of students taught social studies using instructional media and those taught social studies without instructional media.

Table 1 T-test comparison of the mean achievement score of the students taught social studies using instructional media and those taught without instructional media

Group	N	X	SD	t-cal	t-crit	df	P
Experimental	50	59.3	12.8	9.6	2.0	98	0.5
Control	50	41	7.8				

From table 1 above, the mean score of students taught social studies with instructional media is 59.3 which is far higher than those taught social studies without instructional media (41). The difference between the means of the two groups is significant since t calculated value of 9.6 is greater than the t-critical of 2.00 at 0.05 level of significance. Therefore, the hypothesis which stated that there is no significant difference in the mean achievement score of students taught social studies using instructional media and those taught social studies without instructional media is hereby rejected.

Hypothesis 2 : There is no significant difference in the mean achievement scores of male and female taught social studies using instructional media.

Table 2: t-test showing comparison of achievement test of male and female students exposed to instructional media in the teaching of social studies

Sex	N	X	SD	t-cal	t-crit	df	P
Male	25	64	8.4	0.9	2.0	48	0.05
Female	25	56	5.6				

Result in table 2 above indicates that the value of t-calculated is 0.9 which is not significant at an alpha level of 0.05 with degree of freedom of 48. However since t-calculated (0.9) is less than t-critical (2.0), the null hypothesis 2 is not rejected. This means that there is no significant difference in the mean achievement score of male and female taught social studies using instructional media.

Discussion of Findings

In this study, two hypotheses were formulated and tested. Hypothesis one which stated that there is no significant difference in the mean achievement score of students taught social studies with instructional media and those taught social studies without instructional media was rejected. It clearly shows that students that are exposed to instructional media during the teaching of social studies performed better than the students that are not exposed to the use of instructional media in the teaching of social studies.

The findings of this study corroborate the findings of Aiyelagbe (1998) that instructional media has a positive effect on student academic achievement. Also gender has no significance effect on the use of instructional media in the teaching of social studies in secondary schools. The study negates the findings of Abimbade and Egunjobi (2003) who claim that gender has significant effect on the use of technology and also (Abdu-Raheen, 2016) who reported that gender effect was not statistically significant in social studies.

Conclusion

Effective utilization of appropriate instructional media is highly essential to improve teaching and learning of social studies in secondary schools. Improvement and better academic achievement can also be guaranteed through the use of instructional media.

Recommendations

If the standard of education has to be raised, the uses of instructional media should be used for the teaching and learning of social studies and other school subjects. It is therefore recommended that the use of instructional media must be given adequate priority in our school system.

In addition government and all other stakeholders in education sector should as a matter of urgency supply schools with all the necessary instructional media to enhance effective teaching and learning of social studies and other school subjects. Workshops and seminars should be organized for the teachers where they would be trained and equipped on how to select and use appropriate instructional media in the classroom. Government should also encourage educational resource centres and media production centre to intensify the production of instructional media in a large scale.

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RELATIONSHIP BETWEEN JOB SATISFACTION AND CONDITION OF SERVICE OF LIBRARIANS IN NIGERIAN FEDERAL UNIVERSITY LIBRARIES: MIXED METHOD APPROACH

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Abstract

Condition of service is a sort of legal agreement between an employer and employee in relation to work performance and job satisfaction. Therefore, promotion, contingent reward, salary and benefit are paramount constructs of condition of service. In the light of this, the study examined the relationship between job satisfaction and condition of service of librarians in the Federal University Libraries in Nigeria. Survey research method, using both quantitative and qualitative approaches, was employed as a technique for this study. . The population of study comprised of all the librarians in federal university libraries in Nigeria with at least a Bachelor of Library and Information Science (BLIS) degree. Stratified random sampling technique was adopted for this study. The findings obtained from the questionnaires and the interviews conducted revealed that there was a relatively weak correlation between job satisfaction of librarians in Federal University Libraries in Nigeria and Condition of Service. This implies that librarians were slightly satisfied with condition of service. Since the satisfaction of librarians is generally low with condition of service, the provision of information and services in the libraries might not be adequately rendered. This paper provides evidence that this can have a significant impact on library operation and services. Therefore, it is suggested that improvement on condition of service of librarians will assist in maximizing their job satisfaction.

Keywords: Job Satisfaction, Library, Federal University, Nigeria, Condition of Service

Introduction

Research on job satisfaction has attracted the attention of scholars and researchers in different fields such as management, accounting, economics, humanities, library and information science, to mention but a few. Job satisfaction in librarianship has been perceived as a recent field of inquiry. It is the attitudinal behavior of workers towards the work they perform and kind of comfort and ease they attribute to their job which determine the level of efforts they dispense to the job assigned to them. However, it could be argued that researches about job satisfaction in librarianship dated back to 1937, when Nourse (1937) conducted a research. Her findings indicated low pay, work monotony, lack of promotion and the lack of opportunity to take initiative as the principal cause of high staff turnover in the library. In addition, condition of service is a sort of legal agreement between an employee and employer; this includes benefit, promotion, contingent reward and salary.

However, this area of research has not been explored adequately in the field of librarianship in Nigeria. Although, few studies were conducted by librarians at individual University Libraries in Nigeria, not much has been given to issues of job satisfaction. This assertion was revealed in the works of Alao (1992), Tella et al (2007) and Gboyega and Popoola (2010). Although, their findings indicated low job satisfaction, they have not addressed its consequent effects on condition of service of librarians in Nigerian Federal University Libraries. Job satisfaction therefore, eradicates job dissatisfaction to motivate personnel to increase his or her productivity towards achieving organisational goals and objectives (Kaya, 1995).

The economic recession, which began in the early 1980s in Nigeria, affected all job sectors including the library profession, and this has resulted in impeded acquisition of resources, personnel and budgets for libraries. This situation led to low morale among the library workforce in the country. This social-economic environment according to Edem and Lawal (1999) has created suspicion about whether librarians are really satisfied with their job or have been motivated to enhance their performance in their work or not.

The spillover effect of this attitude has led to the majority of librarians quitting their professional jobs, and moving to other non-library related jobs to seek for greener pastures. These problems motivated the researcher to conduct this study to examine whether librarians in Nigerian Federal University Libraries are satisfied with their job in relation to condition of service or not. The above is supported by Murray (1992) stating that, professional librarians who performed more complex and intellectually rigorous jobs in the libraries become much concerned about job satisfaction of library personnel in order to promote their efficiency for the realization of the goals and objectives of librarianship. The reminder of the study is structured as follows. The next section discusses the extant literature whilst the ensuing section details the research methodology. Results are presented in section four with section five concluding the study.

Literature Review

Ford (1992) notes that members of staff, who are professionals were least satisfied with rewards, which included salary and benefits. On the other hand, Gliem and Gliem (2001) opine that academic and continuing education classes for staff development will enhance their job satisfaction and self-esteem. Sierpe (2000) examines job satisfaction of librarians working in English Language Universities in Quebec. The study shows that all the librarians working in these institutions are generally satisfied but have dissatisfaction with the promotion opportunity and salary. The study result suggests that certain job facets may have a larger effect on service quality of one librarian than the others may.

Okojie (2010) reviewed the different sources of financing university libraries in Africa and the challenges faced by libraries in sourcing for funds in order to propose innovative ways through which additional funds can be raised. In addition, Moshoeshoe-Chadzingwa (2010) reviewed human resource management (HRM) in the selected academic libraries of Southern Africa with a view to determining the level at, and manner the libraries and parent organizations can harmoniously better the service condition. However, Tella et al. (2007) examine the work motivation, job satisfaction and organisational commitment of library personnel in academic and research libraries. The authors used descriptive survey design to carry out their research and found that a correlation exists between perceived motivation, job satisfaction and commitment, although the correlation between motivation and commitment was negative. They suggested that it is imperative for the library management to meet the demands of their personnel to strengthen their motivation, satisfaction, and commitment to minimize turnover.

Furthermore, Dogan (2009) conducts a conceptual analysis of job satisfaction and empirical research on the relationship between job satisfaction and a set of variables such as; pay, promotion, positive affectivity/encouragement, job involvement, potential or rest-day and off-day, The study which was based on a sample of 220 employees from Aydin municipality and Nazilli municipality revealed that 50% of the variance in job satisfaction was explained by the variables included in the regression test. Adio and Popoola (2010) investigated the dissatisfaction of library users and managers of each Federal University Library in Nigeria. Relative to the complaint of the librarians working in those libraries on inadequate funding, lack of promotion, poor condition of service and lack of recognition, which affected their career commitment. Their study revealed that job satisfaction had significant influence on career commitment of librarians working in University Libraries.

The main objective of this study is to investigate relationship between job satisfaction and condition of service of librarians in the federal university libraries in Nigeria. As aforementioned, condition of service is a sort of legal agreement between an employer and employee in relation to work performance and job satisfaction. Therefore, promotion, contingent reward, salary and benefit are paramount constructs of condition of service, which have not been thoroughly investigated on the satisfaction of librarians in Nigerian Federal University Libraries of which the present study intends to undertake.

Objectives of the study

The main objective of the study was to examine the relationship between job satisfaction and benefit enjoyed by the librarians in the federal university libraries in Nigeria. The specific objectives are to:

1. determine the relationship between job satisfaction and contingent reward of librarians in the federal university libraries in Nigeria
2. find out the relationship between job satisfaction and promotion of librarians in the federal university libraries in Nigeria
3. investigate the relationship between job satisfaction and pay enjoyed of librarians in the federal university libraries in Nigeria

Research Questions

To achieve the objectives of the study, the following research questions were raised:

1. What is the relationship between job satisfaction and benefit enjoyed by librarians in the federal university libraries in Nigeria?
2. Is there any relationship between job satisfaction and contingent reward enjoyed by librarians in the federal university libraries in Nigeria?
3. What is the relationship between job satisfaction and promotion enjoyed by librarians in the federal university libraries in Nigeria?
4. What is the relationship between job satisfaction and pay enjoyed by librarians in the federal university libraries in Nigeria?

Interview questions

How does Condition of Service affect the job satisfaction of librarians in Nigerian Federal University libraries?

- i. Please share with me the how you perceive the benefit you enjoy as a librarian in this library?
- ii. In what other ways does your employer reward the extra/excess work you perform?
- iii. Please explain to me how you view the promotion package offered by your employer to university?
- iv. What are your feelings about your monthly salary package?

Research Methodology

Survey design approach was adopted for the conduct of the study. This was to be able to cover a representative sample of librarians in the federal universities in Nigeria.

Population

The population of the study is the entire librarians in Nigerian Federal University libraries. In this context, a librarian is a staff in the library that is trained in library and information science up to degree level, e.g. (BLS/BALS). There are 40 Federal Universities in Nigeria. These institutions were spread across the length and breadth of

the country. Therefore, the population of librarians in each university library was estimated to be 20 librarians given the total population of about five hundred and fifty (800) librarians.

Sampling

To obtain the required sample size, the researcher utilized random sampling technique; meaning to say that the researcher selected individuals from the population through random sampling procedure. Stratified random sampling technique was employed for the selection of respondents for this study. The population was stratified into six geo-political zones, i.e. North West, North East, and North Central. Others include South West, South East and South South. Three university libraries from each zone were selected for sampling.

Five hundred and forty (800) librarians were the sampling frame of this study as we consider twenty (20) librarians to be working in each of the Federal University Libraries in the Nigerian. Therefore, the sampling of this study is drawn from eighteen (18) Federal University Libraries in Nigeria, which were gotten from three (3) Federal University Libraries in each of the six (6) geo-political zones. At least twenty (20) professional librarians in each of the eighteen sampled Federal University Libraries constitute a total number of three hundred and sixty (360) librarians. This represents the sample for the study.

Data Collection Method

The copies of the questionnaires were administered to the participants and thereafter six senior librarians were interviewed, one from each geo-political zone. The rationale behind this is that the data obtained from the interview augment the data obtained from the questionnaires (Creswell, 2008). The two instruments were triangulate together to complement one another although each of them is a different entity (Hassan, 2002). All the useable questionnaires were collated and analyzed according to respondents' responses through the application of a 5 point-Likert scale rating using 5-1 rating scale for responses: 5 for the most favourable response and 1 for the least. The research question read thus: *Is there any significant relationship between job satisfaction of librarians in Federal University Libraries in Nigeria and the following factors: Condition of Service?*

Results from the descriptive Analysis of the Content Variables

Benefit

Benefit is the other emoluments enjoyed apart from salary by the Librarians in Nigerian University libraries. Table 1 below presents the responses of the respondents to the items that seek respondents' opinions on the benefit they enjoy at work. It should however be noted that benefit is one of the constructs that form the condition of service.

Table 1: Descriptive Analysis of Benefit

S/N	Statement	Agreed		Disagreed		Neutral		Mean	S/D
		N	%	N	%	N	%		
1	The pension age is satisfactory	211	84	18	8	22	9	4.19	.913
2	The gratuity is reasonable	128	51	67	26.7	56	22.3	3.27	1.095
3	I recover my medical bill for medical treatment	129	51.4	61	24.3	61	24.3	2.54	1.197
4	Annual leave is satisfactory	178	70.9	42	16.7	31	12.4	3.70	1.029
5	Sabbatical grants are satisfactory	109	43.5	47	18.8	95	37.8	3.27	1.073
6	Time off is provided to participate in training and development	143	56.0	55	21.9	53	21.1	3.39	1.098
7	Funding is provided to attend training and development	128	51.0	62	26.7	56	22.3	3.27	1.084
8	I believe work is good for my physical health	22.1	88.1	67	2.4	24	9.6	4.18	.696
9	Doing this job well is a reward in itself	225	89.7	6	2.9	19	7.6	4.24	.762
10	The major happiness of my life comes from my job	156	62.1	49	19.5	46	18.3	3.55	1.114
Total		1628	647.7	418	167.4	463	184.7	38.87	10.06
Total Average		162.8	64.77	41.8	16.74	46.3	18.47	3.89	1.006

N = Number of Participants; SD= Standard Deviation

The result reveals that majority of the librarians are satisfied with the pension age. Almost all of the respondents were satisfied with the annual leave and more than fifty percent felt that the gratuity at the pension age is reasonable. More than half (51.4%) of the librarians recovered their medical bill for their medical treatments. In addition, approximately more than half (56%) were provided time off in order to participate in training and development and above fifty percent consented that findings are provided for them. An overwhelming majority of the librarians believed that the work is good for their physical health and doing it is a reward in itself. In addition, majority of the respondents are of the opinion that the major happiness of their work comes from their job. However, they expressed their dissatisfaction on the sabbatical grant.

Contingent Reward

Contingent reward is the recognition, appreciation and reward received for the extra job accomplished by the librarians in the Federal University Libraries in Nigeria. It is also one of the constructs of the condition of service. Table 2 below summarises the responses of the respondents to the questionnaire items that seek their opinions on reward they receive on extra work done.

Table 2: Descriptive Analysis of Contingent Reward

S/N	Statement	Agreed		Disagreed		Neutral		Mean	S/D
		N	%	N	%	N	%		
1	The work I do is well recognized and appreciated	177	70.5	39	15.6	35	13.9	3.67	.992
2	Any extra work done is well rewarded	65	25.9	120	47.9	66	26.3	2.73	1.058
3	Enough funds are made available for operation	45	17.9	138	55.4	68	27.3	2.59	.953
4	Adequate equipment is provided to do my job	139	55.9	80	31.9	32	12.7	2.73	1.101
5	I feel secured about my work	176	70.2	26	10.4	49	19.5	3.69	.838
6	I received assignment with adequate resources and materials to execute it	85	33.9	105	41.9	61	24.3	2.90	1.059
7	The reward is not delayed but immediate	55	21.9	140	55.7	56	22.3	2.54	1.061
Total		742	295.7	648	258.8	367	146.1	20.85	7.062
Total average mean		106	42.24	92.57	36.97	52.43	20.87	2.98	1.01

N = Number of Participants; SD= Standard Deviation

The result shows that an overwhelming majority of the librarians felt secured on their work and consented that their works are recognized and appreciated. Likewise, high proportion of the respondents shows that adequate equipment is provided and the reward is not delayed but immediate. Contrarily, the respondents expressed their dissatisfactions to the rewards given for extra work done. They also expressed less satisfaction to the funds made available for operations. They were not given adequate resources and materials to execute their assignments.

Promotion

Promotion is the up grading for the attainment of higher position and money that is needed for their job satisfaction which can encourage the librarians to give in their best in their jobs. Table 3 below presents the opinions of librarians on questionnaire items on promotion.

Table 3: Descriptive Analysis of Promotion

S/N	Statement	Agreed	Disagreed	Neutral	Mean	S/ D
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		N	%	N	%	N	%		
1	Promotions are based mainly on merits rather than extraneous issues	177	71.3	38	14.4	34	13.5	3.75	1.061
2	Promotion is accompanied with financial benefit	200	79.7	20	8	31	12.4	3.93	8.78
3	There is always an urge to get to work	179	71.3	23	9.2	49	19.5	3.77	8.69
4	Promotion is regular	142	56.5	61	20.3	48	19.1	3.39	1.131
5	Requirements for the promotion is satisfactory	143	57	63	25.1	45	17.9	3.36	1.07
6	When on study leave promotion is not hindered	83	41.1	68	27	80	31.9	3.11	1.159
7	My arrears are paid in case my promotion is late	161	64.1	44	17.5	46	18.3	3.58	1.045
8	Promotion encourages me to increase my effort	227	90.4	8	0.8	16	6.4	4.25	.747
Total		1437	531.4	325	126.3	349	136	29.14	23.67
Total average mean		179.63	66.43	40.63	15.79	43.63	17.38	3.64	2.96

N = Number of Participants; SD= Standard Deviation

The result shows that the respondents were urged to set to work. More than half of the respondents perceived promotion to be regular and are satisfied with its requirements. The result also reveals that majority of the respondents' arrears were paid in case their promotion is delayed and an overwhelming number of librarians were encouraged to increase their effort. On the contrary, the respondents expressed that they were not promoted when they are on study leaves.

Pay/Salary

Pay/Salary of Librarians in Nigerian University Libraries with respect to what the workers earn as rewards for their labour per month is analysed below (Table 5). It is also a construct of the condition of service.

Table 4: Descriptive Analysis of Pay

S/ N	Statement	Agreed		Disagreed		Neutral		Mean	SD
		N	%	N	%	N	%		
1	Remuneration is commensurate with the job performed	125	49.8	75	29.9	51	20.3	3.27	1.176
2	There is a need for an upward review of my salary	212	80	9	2.4	34	13.5	4.13	.776
3	The payment of my salary is regular	203	80.9	17	1.6	31	12.4	4.06	.901
4	I can live comfortably with	121	48.2	85	33.9	45	17.9	3.20	1.211

	my pay in this organization								
5	My pay is barely adequate to take care of my expenses	117	46.7	89	35.5	45	17.9	3.11	1.188
6	My salary is too much levied with taxes	121	48.6	76	23.1	53	21.1	3.24	1.160
7	My salary is not stopped when on study leave	156	62.9	24	9.6	69	27.5	3.72	.993
8	My employer owes me arrears of my salary	50	19.9	169	67.4	32	12.7	2.26	1.230
Total		1105	437	544	203.4	36	143.3	26.99	8.635
Total average mean		138.13	54.63	68	25.42	45	17.91	3.374	1.079

N = Number of Participants SD= Standard Deviation

The result reveals that about half of the respondents (49.8%) agreed that remuneration commensurate with the job performed. Majority of the librarians wished for the upward review of their salaries, though they agreed that their payment is regular. Less than half of the respondents can live comfortably with their pay and barely adequate to take care of their expenses, though they are less levied with taxes. More than half (63%) of the respondents' salaries are not stopped when on study leave, and none of them is owed arrears of salary.

Inferential Statistics

This explained the types and strength of relationship existing among the variables used in this study. The statistical test used to examine the relationship among the variables is the Pearson product-moment correlation. The benchmark for significant level for the entire test conducted is $P < 0.05$

Analysis of Findings Obtained from the Questionnaire

Analysis of findings was carried out to determine the significant relationship among the variables used for the data collection. Sample characteristics comprise of the librarians sampled from eighteen federal university libraries drawn from the six geo-political zones in Nigeria. Table 5 provides the summary of descriptive statistics of the variables used to answer the research questions of the study. This fulfills the condition to satisfy the normality assumption through maximum and minimum of the population sample, mean and standard deviation, skewness and kurtosis. It should, however, be noted that condition of service comprise of four constructs: benefit, contingent reward promotion and pay. Table 5 above shows that the skewness and kurtosis values are within the acceptable range of -1 and +1 for the test of normality assumption. This implies that the normality assumption holds for the data (Fah and Hoon, 2009).

Table 5: Descriptive Summary Statistics

Operational Variables	Min	Max	Mean	Std.Dev.	Skewness	Kurtosis
Name of Institution	1	18	9.78	5.338	-.043	-1.205
Condition of Service	1	5	3.1377	.65950	-.236	-.249

Job Satisfaction and Condition of Service

This section aims at addressing the research question as stated thus:

Is there any significant relationship between job satisfaction of librarians in Federal University Libraries in Nigeria and the following constructs of Condition of Service?

Pearson's correlation analysis was conducted to determine if there is any significant relationship between job satisfaction of librarians in the Federal University Libraries in Nigeria and the condition of service. Table 6 shows the relationship between job satisfaction and condition of service (as measured by JSS was investigated using Pearson Product-moment correlation coefficient. Prior to the correlation analysis, preliminary analyses were performed to ensure that there was no violation of both the normality and linearity assumptions (see table 6) The correlation analysis presented in shows a relatively weak positive relationship between jobs satisfaction and condition of service ($r=.153^*$, $n= 251$), $P=.015$ is less than alpha level .05. Despite the weak positive relationship there seems to be evidence that if condition of service is favourable, job satisfaction might likely increase.

Table 6: Correlation Matrix

		Job Satisfaction	Condition of Service
Mean		4.1624	3.138
Standard Deviation		.56239	.65950
Job satisfaction	Pearson Correlation	1	.153*
	Sig. (2-tailed)		.015
Condition of service	Pearson Correlation	.153*	1
	Sig. (2-tailed)	.015	

* Correlation is significant at the 0.05 level (2-tailed)

Analysis of Data Obtained from Interview

Analysis of data obtained from qualitative questions (interview). This is carried out in order to augment the results from questionnaires. The researcher first listened to the recorded interview to make sure that it was audible and available for transcription. Thereafter, he transcribed the verbal interview and the transcript was carefully read to make sure that nothing is left unrecorded as to make it ready for the extraction of themes. Subsequently, the transcript was re-read to look out for phrases or statements

that form the “key words that is the moment of experience” or “formed statement.” From these key words or formed statement, a number of themes were generated. They include:

“The happiness I have while carrying out my job; Motivating Job; Moderately satisfying; No problems while carrying out my duties; satisfied with job performed, Lack of motivation and no incentives; Lack of training and delay in promotions; Inadequate working facilities and lack of contingent reward; No benefits enjoyed; No reward for extra work done; Promotion packages okay; Need to be improved to enhance motivation; Salary needs improvement.”

It is noteworthy to mention here that significant statements and themes are derived from the verbatim transcripts of the six interviewed respondents. All six interviews were done on one on one basis and each of the respondents answered the interview questions on different occasions, and they described how they individually view job satisfaction while working in their various Nigerian Federal University Libraries. After the extraction of themes, the researcher matched these themes with the ideas of the elaborators (inter-rather) the themes that were not properly worded were modified to match the meaning of the main ideas.

Findings from the Research Questions

The findings from the respondents’ interview on job satisfaction of librarians in the Nigerian University Libraries are presented through the transcription and formation of themes in this chapter. The emerged main themes from transcription were used to present the findings which were presented according to the arrangement of the research questions.

Research Question

The research question states that ‘*what significant relationship exist between job satisfaction and condition of service of librarians in Federal University Libraries in Nigeria*’? This research question intends to explore the extent of relationship between job satisfaction of librarians and condition of service. Four interview questions emanated from this research question. They are enumerated and discussed below:

Q1: Please share with me how you perceive the benefit you enjoy as a Librarian in this library

This interview question intends to explore the perception of the librarians to other emoluments enjoyed apart from their salary. The reactions of the respondents to the above question include:

These are the perceptions of the respondents to above questions. "I do not have any other benefits; I enjoy some benefits; No benefits enjoyed; No benefits enjoyed apart from monthly salary; No benefit apart from monthly salary."

From the data presented above, it can be summarized that apart from their monthly salary, respondents do not enjoy any other benefit while working as librarians in the Nigerian Federal University Library.

Q2: In what other ways does your employer reward the extra/excess work you perform?

This question was asked in order to elicit responses from the respondents. It is aimed at making them express their feelings on the reward given for extra work done. Extra/excess work load is the number of additional works or hours added to the normal routine work to facilitate a smooth working condition.

"No reward in the form of cash is given as motivation for my extra work/time spent in this library; No reward for extra work done."

In summary, from the responses of the respondents, extra works are not rewarded for the librarians working in Federal University Libraries in Nigeria.

Q3: Please explain how you view the promotion package offered by your employer to University

The question explores the perception of the respondents about the reward for staying in a job on meritorious service for a required number of years.

"Promotion package offered to library staff is fairly satisfactory; Promotion package satisfactory; Promotion package okay, but need to be improved to enhance motivation; Promotion package satisfactory; it is moderately satisfying and need to be improved upon; Promotion package is moderately satisfying; should be improved upon."

The summary of the responses of the respondents is that promotion package is moderately satisfactory and should be improved upon.

Q4: What are your feelings about your monthly salary package?

This question seeks the opinions of the respondents, whether the salary given to them for a job well done commensurate with the services rendered. From the reaction of the respondents it is noted that:

"Salary is not too good... I want the salary package to be improved; Salary needs improvement; Salary needs improvement; improved salary can enhance staff motivation to work."

It could be summarily said here that the salary package is not satisfactory and needs to be reviewed for improvement.

Discussions

Major findings from the data were analysed and compared with the findings from the existing related literatures to support or contest the findings from the study. Majority of the respondents expressed their satisfaction to the benefit they receive from their work. The finding is in conformity with those of Leckie and Brett (1997) and Sierpe (2000) that find a high job satisfaction on benefit. Below are some of the comments provided in the questionnaire by the respondents in respect to benefit, although some of these comments are general and positive, while others are negative.

“The organization should find better way of motivating their staff. Benefit for study such as ETF, there is no scholarship for academic like other institutions.”

“The national pension scheme should be abolished because it is another way of enslaving workers.”

“I feel satisfied about my benefit. Benefit e.g. pension should be paid by the university.”

Although, the overall benefit is satisfactory, there are still areas needed to be addressed to make the job satisfactions of librarians in the Federal University Libraries in Nigeria to be accomplished. On the overall librarians in Nigerian University Libraries are not satisfied with contingent rewards. This finding is in contrast with the findings of Sierpe (2000) that reveals librarians to be highly satisfied with contingent reward. Nonetheless, the findings by Malliaiah (2009) show moderate levels of job satisfaction of librarians to contingent reward. These are comments and suggestions provided by the participants as additional information on contingent reward. Some of these comments were general and positive, while others were negative. The followings are the selected comments from the respondents.

“Reward for any extra work is not available for academic in the library.”

“There is no encouragement from the authority concerned.”

The comments and suggestions corroborate the earlier findings that contingent rewards are not adequately given to the librarians in Federal University Libraries in Nigeria. Generally, majority (66%) of the respondents expressed their positive opinions to promotion as a source of their satisfaction. This is corroborated by Sierpe (2000) who finds librarians satisfaction with promotion to be relatively low. Contrarily, Kostea (2009) finds a negative correlation between job satisfaction and promotion. Concomitant findings by Togia et al., (2004) show a significant relationship between

promotion and job satisfaction, but findings by Malliaiah (2009) reveal a moderate level of job satisfaction to promotion. The following are selected comments and suggestions provided by the participants as additional information on promotion. Some of these comments corroborate the earlier findings and some do not.

“Requirements for promoting academics in the library are not satisfactory.”

“They should pay for the year arrears when promotion is delayed.”

Although, the comments and suggestions are not in contrast with earlier findings but the respondents suggested other ways to make their promotions adequately satisfactory. More than half of the respondents conveyed encouraging views on their pay. The finding is in conformity with Sierpe (1999) who finds relatively low satisfaction with salary. This was further corroborated by Togia et al (2004) who indicates fewer significant relationships between pays and job satisfaction. But findings by Malliaiah (2009) reveal moderate levels of job satisfaction with respect to pay. The following are selected comments and suggestions provided by the participants in addition to the findings on pay. Some of these comments corroborate the earlier findings and some are in contrast.

“Need for payment of end of the year bonus.”

“Study allowances are not sufficient commensurate with related agencies.”

“Apart from my regular salary no other remuneration is received even in terms of seminar.”

Discussion of Inferential Statistics in Conjunction with Interview

Discussing some of the relationships that were found in this study, the data were analyzed through the use of Pearson Product Correlation. Based on the findings obtained from these analyses, some inferences were made and supported by the responses from the interview of respondents; these were discussed as follow.

RQ: Is there any significant relationship between job satisfaction of librarians in Federal University Libraries in Nigeria and Condition of Service.

The findings from the analysis revealed that there was a relatively weak correlation between job satisfaction and condition of service which includes benefit, salary, contingent reward, and promotion. On the other hand the findings with Togia et al (2004) revealed significant relationship between working condition and job satisfaction. To this effect, Aguolu (2007) stresses that conducive condition to effective professional service has not yet existed in Nigerian University Libraries. Consistence with above, Sierpe (2000) found that librarians working in the English Language Universities in Quebec are generally satisfied but have dissatisfaction with the promotion, opportunity, and

salary communication and operating procedures. His result suggests that certain job facets may have a larger effect on service quality of one librarian than the others. The result from correlation is buttressed by the respondents' responses to the interview below

"As a librarian in this university library I do not have any other benefits which I enjoy apart from the statutory ones."

"Well, in my opinion, I enjoy some benefits in this library and remuneration is commensurate with the job performed statutorily."

The above interview findings show that the librarians' satisfaction on benefit is very low. They have not been benefiting from their job to their utmost satisfaction. This finding contradicts the findings of Leckie and Brett (1997), who reported overall satisfaction of librarians on benefit and those of Sierpe (2000), who also found high job satisfaction benefit among librarians.

This study also shows that there was no reward for the extra work done by the librarians. This is pathetic and demoralizing because a person putting extra hours or energy to his work wants the job to be sustained to help the organization meet up with its aims and objectives. He needs to be treated in a special way that will reciprocate the extra efforts he exacted. This could be seen from the respondents' expressions to the interview questions on excess work load.

"We are usually not given extra reward in the form of cash as motivation for our extra work/time spent in this library, although sometimes my boss says encouraging words to me and that is all".

"I think extra work performed needs to be recognized and duly rewarded, but the reverse is the case in this library. I am usually not rewarded for any extra work done."

This is an indication that librarians in Nigerian Federal University Libraries are not rewarded for any extra work done. This corroborates with the findings of Ekoja and Adamu (2003) which reveal that excess workload allowances are not paid to the librarian as compared to the university lecturers. The finding shows that the librarians are satisfied with their promotions. Generally the librarians were satisfied with the promotion in the Federal University Libraries in Nigeria. Some of the responses of the librarians to interview questions on promotion are as follow:

"The promotion package offered to us as university library staff is fairly satisfactory and I also want to use this opportunity to say that our employers should start thinking about making it much better that it is right now."

"I think the promotion process and package offered by this university library to the staffs is satisfactory. Although it still needs to be improved upon."

The findings supported that of Togia et al., (2004) which show significant relationship between promotion and job satisfaction, while the findings by Malliaiah (2009) reveals moderate level of job satisfaction to promotion. Contrarily Kosteas (2009) finds a negative correlation between job satisfaction and promotion of librarians.

Conclusions

The study examined the relationship between job satisfaction of librarians in the Federal University Libraries in Nigeria and condition of service. Data analysis was carried out based on the data obtained from the questionnaires and interviews. The findings also reveal that more than half of the librarians in the Federal University Libraries in Nigeria are satisfied with benefit accorded them by their respective libraries, although less than half of the librarians are satisfied with Contingent Reward. About three-quarter of librarians in the Federal University Libraries in Nigeria expressed their satisfaction with regard to Promotion. More than half of the librarians in the Federal University Libraries in Nigeria are satisfied with their Pay/Salary. The findings from Pearson product-moment correlation results reveal that there was a relatively weak correlation between job satisfaction of librarians in Federal University Libraries in Nigeria and condition of service.

Similarly, data analysis of the interview of librarians in Federal University Libraries in Nigeria on condition of service, indicates low satisfaction. Based on the findings above, job satisfaction of librarians in Federal University Libraries in Nigeria with condition of service is generally low. The trend of change in the library profession with current challenges in information industry required the staff of libraries to be up to the task and be readily equipped to face challenges. This could be achieved when the librarians are made to be satisfied with their jobs, because successful management of any organisation depends largely on the high morale and satisfaction of its workers. Though the present study, as anticipated, has contributed to the knowledge based on job satisfaction of librarians from the Nigerian point of view, the horizon of the literature may have a wider use beyond the context of the Nigerian perspective.

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ADDRESSING THE BARRIERS OF IMPLEMENTING MANAGEMENT INFORMATION SYSTEMS IN BUSINESS ORGANIZATIONS

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Abstract

Given the increase in complexity seen in accelerated global competition, management information systems (MIS) are becoming powerful tools for helping organizations succeed. This paper addressed the barriers of implementing management information systems in business organisations. It discusses the role of leadership in the process of implementing management information systems in a business organization, it examines the main challenges or barriers that characterize the implementation process of management information systems in the business world, and looks at the issues of leadership in the process of implementing management information systems in information organizations, leadership style and effect on information system success, identifies the success factors in implementation of information system strategy. Similarly, it identified the strategies that can be used by business organizations to enhance the effectiveness with which they implement management information systems in their respective operational systems.

Keywords: Information systems implementation, Information systems, Information system success, Business organisations

Introduction

To thrive in today's competitive landscapes, business organizations need to have strong vision for strategic leadership and a technological and technical understanding of the way in which their organization competes (Kash, Spaulding, Johnson, & Gamm, 2014). Recently, businesses have sought to hone competitive advantages and core competencies in order to succeed in marketplaces and find the most successful balance of productivity and performance, while also maintaining control over cost and quality (Li, & Lui, 2014). Because of these reasons, management information systems (MIS) offer operational tools for competition that can improve leadership strategy by enhancing efficiency, in effect offering leaders a clearer understanding of how their organizations create value (Witcher, & Chau, 2014). MIS can be defined as using computerized systems to process information in ways that allow for a greater understanding of how the organization competes and how its efforts can be effective, such as by measuring activities, actions, decision-making, and other processes that are necessary for organizational success (Kivinen, & Lammintakanen, 2013). Simply put, when used properly MIS allow for organizations to understand how well they are competing and what can be changed in order to compete more effectively.

While MIS are not new, beginning when mainframe computers first began to help manage organizations in the 1970s, MIS are becoming used more frequently and are more common (Sedera, et al., 2016). Originally, the ways that mainframe computers were used are not that different than how they are used now, such as enhancing organizational processes and actions that involve information—but the effectiveness of approaches now is faster and of an exponential magnitude because of not only the increase in computer processing power but also in how companies can sometimes learn to leverage information to a much more effective degree, meaning that not only is more information available at a faster speed, but organizations, at least some, have also learned how to do a much better job of putting information into practice in rapid or real-time ways (Yoo, 2013). For many industries and competitive sectors, therefore, it is clear that an organization that can assess, strategize, and respond more quickly than its competitors can find opportunities where competitive advantages can create value (Koren, Wang, & Gu, 2017).

Since those early mainframes, advancements have uncovered ways information can be managed, using computers to expand in a similarly exponential fashion (Yoo, 2013). Now, organizations can have customized systems that allow information to be managed in ways that will fit the exact needs of the organization, such as using MIS to handle inventory based on specialized software and computer programs that are custom designed for the specific needs of a given organization (Pai, 2012). Many advantages can be uncovered by the use of MIS, yet stagnancy or cultural resistance and other factors can impede the ability of some organizations to implement MIS and access those advantages (Chatman, Caldwell, O'Reilly, & Doerr, 2014). General aspects appear to be technical incompetence, leadership that does not lobby support or establish a path that helps followers buy into goals, inadequate planning in advance of implementation, and the choice of the systems that are incompatible with the goals and the objectives that the organization is trying to accomplish (Titi Amayah, 2013).

Even when MIS are aligned with what the organization is trying to accomplish, the advantages can only be accessed when there is effective implementation of MIS. The benefits such as quality control, cost-effectiveness, or enhancement of other competitive advantages that allow for efficiency or better decision-making all require the effective MIS implementation (Whitley, & Kite, 2013; Tanja, & Borka, 2012). The ability to succeed by using MIS therefore depends on how effective organizations are when it comes to getting people to actually use MIS (Glover, 2016). An organization is only likely to benefit from MIS when the MIS are accepted into organizational systems and processes (Kash, Spaulding, Johnson, & Gamm, 2014). The decision-making by a leader will not be improved by access to powerful information if that leader never looks at the information, and that can be true throughout an organization (Kothari, 2015). Since this is true for many aspects of MIS and why it is important to identify ways

organizations can succeed by making better use of MIS, it all begins with the implementation process (Park, & Lee, 2014).

Since the benefits of MIS require the ability of an organization to overcome barriers to implementation, organizations should always seek to make implementations successful. One of the primary obstacles when implementing MIS is that the technology involved requires a certain threshold of competency for technological proficiency (Sadler, 2016). In the same way that computer technology has evolved significantly since the mainframe computers of the 1970s, that process has continued and means technological competencies are required for stakeholders to make effective use of MIS (Sedera, et al., 2016). If companies cannot develop or find the right people with the necessary technical proficiencies, then the ability to implement MIS will be compromised (Kash, Spaulding, Johnson, & Gamm, 2014). For example, the wrong kinds of MIS can be chosen and they will therefore be incompatible based on the business needs. Technical incompetence and cultural resistance can impede the effectiveness of MIS even when the proper tools are in place and aligned with organizational priorities (Park, & Lee, 2014).

Additionally, given MIS might not align with business needs or might only match up with certain distinct competencies for the organization. Barriers can begin when it comes to selecting and implementing management information's systems that are able to help address organizational needs (Paterson, 2012). There are multiple barriers that can impede implementation of MIS in business organizations, but a core consideration in any situation where implementation fails is ineffective leadership (Park, & Lee, 2014). Leadership is always an important factor that plays a crucial role in determining success and that remains true within the implementation of MIS (Kash, Spaulding, Johnson, & Gamm, 2014). Ineffective implementation of MIS can conceivably be a far worse problem than never trying to implement MIS. When organizations do not develop effective leadership for the implementation of MIS into internal mechanisms, they become more likely to fail (Kothari, 2015), so this study will seek to assess the ways in which barriers to MIS can impair business organizations, looking to identify barriers and best practices that have been used to address these barriers.

In lieu of the identified problem above, this review intend to answer the following questions: What is the role of leadership in the process of implementing management information systems in a business organization? What are the main challenges or barriers that characterize the implementation process of management information systems in the business world? And; What strategies have been used by business organizations to enhance the effectiveness with which they implement management information systems in their respective operational systems?

Literature Review

Most businesses success involves finding the most effective ways to deliver goods or services (Koren, Wang, & Gu, 2017). In other words, most businesses buy and sell a product like a good or service. Thus, in any competitive marketplace, a business organization can rarely succeed if it is not honing the competitive advantages and core competencies that make up the activities and processes that allow the delivery of goods and services to the customers and stakeholders who help the organization succeed (Whitley, & Kite, 2013). Because of the significance of delivery of goods and services, many tactics have been explored that have sought to enhance organizational performance in these areas (Martins, Rindova, & Greenbaum, 2015). An example would be how a factory has a supply chain from the beginning of raw materials until when a manufactured good is delivered, such as by distributors (Koren, Wang, & Gu, 2017). Almost all industries have inputs and outputs like this, even if the overall supply chain is not as clear as what is seen in a factory (Whitley, & Kite, 2013). It is relatively universal that companies that seek to turn a profit and stay in business are selling something (Koren, Wang, & Gu, 2017). In the last few decades, the use of MIS has been identified as a way that organizations can improve performance and competitiveness by leveraging information to help overall business performance (Tanja, & Borka, 2012). MIS rely on computers in almost all cases because of the ways that information or product handling involves technology (Sedera, et al., 2016). A large warehouse must use some sort of inventory tracking and most service industries will rely on computerized schedules by now. Measuring the inputs and outputs of any business process are often the most important tools for being able to measure core competencies and competitive advantages (Tanja, & Borka, 2012). The advancements in computer technology that started in the 1970s are therefore crucial for leading to the current state of advanced MIS for contemporary businesses.

Because it is clear that many organizations can sharpen competitive advantages by using information, it is clear that MIS can help businesses in many ways (Whitley, & Kite, 2013; Tanja, & Borka, 2012). A relatively common consideration is that MIS can help cut costs or be more efficient (Yoo, 2013; Sedera, et al., 2016). In general, improvements to a business model are going to involve either cutting costs or improving quality. Being able to align an organization with the systems that allow for these kinds of improvements can help companies either cut costs or deliver higher quality for the same price, in effect minimizing operational costs when MIS are used properly and are aligned with organizational priorities (Thompson, 2014). An example of this is when MIS enhance the effectiveness of marketing expenditures, allowing business leaders to increase or decrease marketing efforts by putting the available dollars where they will be most effective. Another example would be that MIS can improve cost effectiveness by creating a way of measuring business needs and prioritizing available resources. Budget analysis is also a way that organizations can benefit from MIS.

In general, the definition of MIS as a discipline would therefore involve how organizations can seek to use technology to better manage the ways that organizations can be competitive by using information (Kivinen, & Lammintakanen, 2013). In most cases, effective competition is the most important strategic consideration for any organization because competitive advantages can help the organization in its various marketplaces (Martins, Rindova, & Greenbaum, 2015). Barring companies that lack major competitors or where an industry is extremely mature or stagnant, the strategies of how to compete are the most important considerations for the defining organizational success (Whitley, & Kite, 2013; Tanja, & Borka, 2012). When these factors are aligned with the ways in which an organization measures or assesses its own performance, MIS can therefor improve competitiveness. When an organization understands what should be measured and can use that information more effectively than its competitors, then the organization will be more likely to succeed (Thompson, 2014). As such, much of MIS use in practice involves enhancing competitiveness by collecting data from stakeholders and analyzing the information in order to make better management decisions (Pai, 2012). In these ways, trends and patterns of interest can be monitored in terms of marketing, budgeting, manufacturing, scheduling, or other organizational priorities. Organizations can make better decisions in how and where to use available resources, hone competitive strengths, or control the cost or quality of inputs and outputs.

The use of MIS in business involves finding ways to make better decisions (Martins, Rindova, & Greenbaum, 2015). Decision-making is one of the most important aspects of operating and managing organizations (Thompson, 2014), and strategic vision must be based on understanding the environment within which an organization competes (Martins, Rindova, & Greenbaum, 2015). Succeeding in contemporary competitive landscapes involves being able to make decisions in ways that help organizations to reach their goals and objectives. Being objective and understanding information clearly in the ways that are most applicable is crucial for successful decision-making in contemporary business (Tanja, & Borka, 2012). As such, making objective decisions based on information that can be obtained is often significantly more effective than relying on subjective personal opinions or intuition. Gradually, it has become clearer that an informed approach to decision-making is more likely to succeed than if leaders make decisions on things that are subjective or inaccurate competes (Martins, Rindova, & Greenbaum, 2015). Using MIS to analyze organizational competitive factors is a powerful way to bring objectivity to the forefront of strategy and decision-making (Tanja, & Borka, 2012). When MIS are used effectively, the available information can be analyzed based on what the company or organization needs most, which can allow leaders to have a clearer understanding of what is really going on in organizational systems.

Another relevant area for understanding this form of competitive advantage that can be found through MIS is in quality control (Zheng, Zhao, & Stylianou, 2013). Quality

control can involve benchmarks and the assessment of standards, whether through manufacture of goods or delivery of services or other factors that are important for organizational success. MIS allow a much more effective way of viewing quality control because standards can be set and then monitored in real time allowing decision makers to understand exactly what is happening with the manufacturer or distribution of a given product or service. When standards are not being met, that will become apparent more quickly and a course of action can be developed that is based on the actual problem that is being faced (Zheng, Zhao, & Stylianou, 2013). Quality control helps organizations to become more competitive and that shows how MIS can improve operational systems in many organizations that compete around the world.

Recently, it is becoming more apparent that organizations that invest in research and development can be an important area for implementing MIS in order to allow organizations to make better business decisions (Stewart, 2015). Contemporary organizations that invest heavily into research and development can access more effective decision-making tools by using MIS (Doolin, 2016). Altogether it therefore seems clear that the effective management of organizations in order to make better decisions that help and organization to compete can be accessed through the use of technology and MIS (Hill, & Jones, 2012). The tools can be powerful, but an organization has to find an effective way to bring the technology into everyday use (Zheng, Zhao, & Stylianou, 2013). Many of the most valuable competitive advantages that can be found through MIS require that more routine organizational processes be measured, managed and observed. An example of this would be how cutting costs in a small but precise way can add up gradually and save an organization large sums over time (Qrunfleh, & Tarafdar, 2014). But investing in research and development for MIS requires that people know how to use these technologies and apply these technologies. To succeed in the use of MIS, an organization must therefore be led in a way that allows for the successful implementation of MIS.

In business, the ability to embrace change is not something that is universal. To succeed in the use of MIS, an organization must be able to align the priorities and systems of the organization with the use of information. The organizational structure and culture of an organization is therefore critical in determining if MIS can be implemented in a way that is effective. The goal for any organization seeking to implement MIS should therefore be to help create a learning organization that can retain knowledge and learn how to adapt to change (Spillan, 2016). MIS can help organizations to overcome obstacles, but in some ways there are hardware and technological aspects of aligning MIS and then there are human factors that involve how some organizations encounter stagnancy and resistance when it comes to implementing the systems.

Leadership in the Process of Implementing Management Information Systems in Information Organizations

Leadership is a process of influencing employees to work the achievement of objectives (Lussier, 2008) Leadership as the ability to influence others to reach our objectives (Draft, 2003). Statements that are not much different expressed also that leadership with regard to activities to influence, motivate, and enable others to contribute to the effectiveness and success of the organization to which they belong (McShane & Glinow, 2010). Leadership as a process of influencing others to facilitate the achievement of organizational objectives relevant (Ivancevich, Paske, & Matteson, 2011). The understanding of the wider leadership that leadership as a process of social influence, leadership is not a position, position or privilege, leadership is a responsibility and a process that can be observed, it is understood, can learn a set of skills and practices available to each people, anywhere in the organization. Leadership is the ability indirectly to influence others by setting an example that inspires award - leadership is not only an example for a moment, but one that inspires others to pursue goals that benefit the organization (Lewis, Goodman, & Fandt, 2004).

Leadership style

Leadership based on the description in the context of this study can be defined as the ability to influence the motivation and competence of the system user to use information management system to effectively and successfully to produce quality management information. Leadership style means how/behavior of leaders to influence motivation, competence, satisfaction and performance management information system users to use management information systems in situations and directed through the communication process to produce high quality management information.

Leadership style and effect on information system success

Information system plays a critical role in the success of the business organization, as they provide information that supports the efforts of the organization in achieving the expected goals (Amidu et al., 2011). Information system produces useful information, in which they serve as a basis for the management for strategic decision making (Naranjo-Gill, 2004) and exercises control of organizational activities in order to achieve organizational objectives (Grande et al., 2011). According to Loudon and Loudon (2012), organization that implements information systems can improve their business strategies in: operational excellence, new products, services, business models, customer and supplier intimacy, improved decision making, competitive advantage and survival. The successful application of the information system to encourage improvements in the daily business operations and can improve the quality of decision-making companies, which are both a major component in the creation of the company's performance (Gelinas and Dull, 2010). Information system is developed with the aim to reduce

operating costs and help create a better quality in managerial decision making to generate information that can be used throughout the company (Carton and Adam, 2005). Wongsim and Gao (2011) explain that organization relies heavily on the use of information systems in the accounting process to produce accounting information. Ogah (2013) states that the accounting information for instance generated from the accounting information system can help managers to understand their tasks more clearly and reduce uncertainty before making a decision. Nicolaou et al., (2000) found that the accounting information system effectively generate communication and control information for decision-making in the field of accounting and management. Chong (1996) showed that the accounting information can help managers to better understand their duties and reduce uncertainty before making a decision. Mitchel et al. (2000) stated that the accounting information can help organizations manage short-term problems by providing information to support the monitoring and control. Accordingly, Sajady et al. (2008) noted that the benefits derived from the accounting information system can be evaluated by looking at its impact on the improvement of the decision-making process, the quality of accounting information, performance evaluation, internal control and facilitate transactions of the company.

Strategies Business Organizations Can Use to Enhance the Effectiveness in the Implementation of Management Information Systems

A variety of definitions of ISS have been raised in the literature (Almalki, Al-fleit, Aasim, 2017). Wilson (1989) looked at the information system strategy from the perspective of its role in business strategy as the analysis of the role that information systems do to help the companies or business in identifying a path to strategy competitiveness. Wilson also introduces another definition in the field of the ISS role in the future vision of IS in the organization. He defined the information systems strategy function to bring together the business goals of the organization and the implementation of computer systems. It is an improvement plan of systems to a future vision of the organization information systems. Another definition by Earl (1987) considered the information systems strategy as implementation strategies that intend to align the Information system development with the business requirements and investigate the competitive advantage from the information technology.

A management information systems strategy is a plan for developing management information systems, which maximize the ability of the organization to achieve its agreed objectives. A strategy provides the framework for the organization for ensuring competencies between systems, prioritizes development, and encourages the elimination of redundant systems. A successful MIS strategy brings the following benefits (Jamwal & Singh, 2011):

- Information systems opportunities and needs are identified and prioritized according to public service objectives rather than to technical criteria.
- Top management develops commitment to a strategic vision for information systems.
- Competency between information systems is ensured, thus avoiding wasted investments.
- Attention is focused on the need to eliminate or reengineer redundant information systems, reducing the
- very significant risk that poor systems will be expensively computerized.
- MIS strategy has four distinct components: information strategy, information technology strategy, information management strategy, and change management/implementation strategy.

Jamwal and Singh (2011) identified four strategies that enhance effectiveness and successful implementation of information systems as information strategy, information technology strategy, information management strategy and change management and or implementation strategy. These are discussed as follows:

Information Strategy

Information strategy acts as the linchpin between the academic strategy and the MIS strategy. It answers the questions: what information is required? And where is the information required to support the primary tasks, or key goals, of the academic strategy. It also questions the appropriateness of the critical assumptions behind the academic strategy in light of the changing environment and changing perceptions. This assessment and review process is one of the core concepts behind this model. Thus, strategy should have both deterministic and emergent elements.

Information Technology Strategy

Information technology strategy is of secondary importance: it is concerned with applications and platforms, the 'nuts and bolts' of how to provide the information. Thus, it is concerned with the technological infrastructure necessary to fulfill the requirements of the information strategy (Peppard & Ward, 2004).

Information Management Strategy

Information management strategy is concerned with how the information services are organized for the different facets of the institution (i.e., centralized, distributed, out-sourced) and policy issues such as who gets access and what level of access they receive (Beard & Sumner, 2004).

Change Management/ Implementation Strategy

Change management/ implementation strategy will identify what organizational change will be needed for the information systems strategy to be successful and when it will be implemented and by whom. Importantly, those who will implement the strategy should be involved in its formulation and specific plans and budgets should be drawn into the process here.

Asides of these strategies indicated and discussed above, if properly managed, there are associated benefits and at the same time there challenges for successful and effective implementation. The benefits have been mentioned earlier. However, the challenges are discussed in the next section of this paper.

MIS Implementation

The implementation of new information systems is a significant investment for organisations. Since information systems are socio-technical systems, development involves the joint design of activity systems and ICT systems. This information system implementation process concept is similar to a five-step process called the information systems development cycle which includes the steps of:

(1) investigation; (2) analysis; (3) design; (4) implementation; and (5) maintenance.

System Development Life Cycle (SDLC) is process of creating, or altering information systems, and the models and methodologies used to develop the systems. Stages/Phases in SDLC are:

- Systems Investigation
- Systems Analysis
- Systems Design
- Systems Development
- Systems Implementation
- Systems Maintenance

System Investigation is all about the assessment of the feasibility and practicality of system to determine if a new system is needed. There are five primary tasks that are inclusive:

1. List problems, opportunities and directives
2. Negotiate preliminary scope
3. Assess project worth
4. Plan the project
5. Present the project and plan

System Analysis is all about the in depth study of old system and identifying new system requirements. This can take the form of:

1. Defines system from user's view
2. Forms of analysis

3. Organisational Analysis
4. Analysis of Present System
5. Functional Requirements Analysis

System Design has to do with the design new/alternative system which specifies how the system will accomplish the objectives. It consists of design activities to be implemented as reflected earlier in the systems analysis stage. Systems design consists of 4 major activities:

1. User Interface Design
2. Data Design
3. Process Design
4. System Specifications

System Development is about building the system to the design specifications, develop the software, purchase off-the-shelf software or write custom software, acquire the hardware and test the new system.

1. Module (unit) test - tests each part of system
2. Integration testing - tests system as one unit
3. Create manuals for users and operators

System Implementation This concern installing the system, convert from old system to new system, train end users and compile final documentation and testing and evaluating the new system. There are approaches to system implementation. This involves all of the followings:

Direct Approach

Direct installation of the new system with immediate discontinuance of the old existing system is referred as “cold turnkey” approach. This approach becomes useful when these factors are considered.

1. The new system does not replace the existing system.
2. Old system is regarded absolutely of no value
3. New system is compact and simple.
4. The design of the new system is inexpensive with more advantages and less risk involved.

Parallel Approach

The selected new system is installed and operated with current system. This method is expensive because of duplicating facilities and personnel to maintain both the systems. In this approach a target date must be fixed when the operations of old system cease and new one will operate on its own.

Modular Approach

This is generally recognized as “Pilot approach”, means the implementation of a system in the Organization on a piece-meal basis. This has few advantages such as:

1. The risk of systems failure is localized
2. The major problem can be easily identified and corrected before further implementation.
3. Operating personal can be trained before system is installed in a location.

Phase-in-Implementation

This approach is similar to modular method but it differs because of segmentation of system, however, not the organization. It has advantages that the rate of changes in a given Organization can be totally minimized and the data processing resource can be acquired gradually over a period of time. System exhibits certain disadvantages such as limited applicability, more costs incurred to develop interface with old system and a feeling in the Organization that system is never completed.

Success Factors in Implementation of Information System Strategy

Strategy implementation has less attention in the research than strategy formulation or strategy planning and many textbooks perceived it as distinct from strategy formulation, however, that seems limited (Aaltonen & Ikävalko, 2002)., they are both an interrelated process to achieve the competitive advantage objectives of the organization. Researchers (e.g. Arvidsson et al., 2014) indicated that if the planned strategies match the realized strategy which both aims to reach the organizational vision the strategy will be considered successful and will be implemented successfully.

The key success factors should be determined to guarantee the success of IS strategy implementation. Arvidsson, Holmstrom and Lyytinen (2014) suggested some challenges to successful IS strategy implementation in their research as the follows.

- First, is to perform ideal aligning of the strategic purpose with the system capabilities.
- Second, is to achieve the system implementation in the overall organization.
- Third, is to form the system usage and the exercise related to it toward the alignment objective with the strategic purpose.

Cutting-edge information systems strategies unusually occur by accident. IS managers have the responsibility for improving IS strategy and managing the daily IS operations of the organization.

Moreover, cooperation between different part of business, real assistance between the system provider and the end-user, and establishing the project team members with the appropriate skills for the proper job are important success factors in the implementation

of ISS (Kornkaew, 2012). What is important here, the IS strategy should determine according to the requirements of the business in the organization, not to the technology availability.

Challenges and Barriers that Characterize the Implementation Process of Management Information Systems

As pointed out by Almalki, Al-fleit, Aasim (2017) many issues may happen during the implementation of ISS. These problems can be noticed in each step of the development of ISS. The issues impact the planning, designing, and implementation of information systems in organizations. From extant literature, a number of challenges/issues have been identified as confronting the implementation of information systems in organisation. From their own perspective (Jamwal & Singh, 2011) identified the following:

- Large number of disparate information management systems.
- Little integration or coordination between information systems.
- Range of legacy systems requiring upgrading or replacement.
- Direct competition between information management systems.
- No clear strategic direction for the overall technology environment.
- Limited and patchy adoption of existing information systems by staff.
- Poor quality of information, including lack of consistency, duplication, and out-of-date information.
- Little recognition and support of information management by senior management.
- Limited resources for deploying, managing or improving information systems.
- Lack of enterprise-wide definitions for information types and values (no corporate-wide taxonomy).
- Large number of diverse business needs and issues to be addressed.
- Lack of clarity around broader organizational strategies and directions.
- Difficulties in changing working practices and processes of staff.
- Internal politics impacting on the ability to coordinate activities enterprise-wide.

In addition to the above, Almalki, Al-fleit, Aasim (2017) also identified challenges such as human, management, technology, environment, time, etc of implementing successful information system in organizations.

Human Challenges

Human issues are the issues relating to every person in the company or organization (Aaltonen & Ikävalko, 2002). Human obstacles barriers are stated by Wilson (1989) while he distributes a survey to 500 companies that implement IS strategy to rank the

obstacles. The results showed that the challenges in the lack of resources to engage in user-education, inability in recruiting appropriate staff, and inability to employ experts who suitably accomplish the information technology activities, were the challenges that caused ISS implementation to fail. The obstacles on the ways that hinder the fulfillment of the expectations of users is also one of the important challenges that may occur (Arvidsson & Sheti, 2003). Lack of computer skill was equally identified as a key challenge and major difficulty to the development of IS. There is a lack of general computer skill amongst the employee of the organization. Most of the older employee displayed a lack of interest and willingness to learn computer skills which had a high negative impact on the operation of the organization (Ossai & Degoke, 2014).

Management Challenges

The information system has to provide an approach to work with the different issues and to be aware of all information management aspects. A study by Lederer and Sethi (2003) found that over half the respondents said the implementation issues is an extreme problem. It means that once the plan of IS strategy was developed; they need to persuade top management to approve the suggested systems so development. Sometimes senior management may not understand the purpose or may not trust the IS strategies capability to carry it out. Therefore, they can recommend that the executives should examine its responsibility to implement the plan before they confirm the time and budget required to develop the ISS. Some of the challenges facing management today are the need to align its information systems strategy and business strategy. Identification of the IS gap between where the organization is and where it want to be in the future.

Technical Challenges

Technical systems challenges are the issues relating to the hardware and software aspects of the information technologies (Aaltonen & Ikävalko, 2002). Also, barrier such as telecommunications issues may exist (Wilson, 1989). Another factor that was identified by Ossai and Degoke (2014) as a challenge to IS development is infrastructures (hardware and software), also the difficulties in the migration from old to the new system in terms of upgrading previous systems is a major challenge.

Environment Challenges

Organizational environment challenges are identified as factors which are less visible and uncontrollable environmental factors such as organizational culture, change, behavior, inadequate capabilities, poor coordination and distribution of responsibilities, competing for activities and unaligned organizational systems and resources (Aaltonen & Ikävalko, 2002). Other barriers that had less importance were existing political conflicts, lack of commitment to the strategy, middle and senior management attitude involving the interaction and direction of the organization executive, misunderstanding or confusion of the strategies and doubts about benefits (Wilson, 1989).

Time Challenges

Roodsaz, et al. (2013) mentioned that many factors may contribute to difficulties such as lack of proper analysis of time. Extending the time of planning and implementing the system may lead to canceling the whole project because the strategies might be modified in that period or changed in needs of users. Arvidsson et al. (2014) addressed the challenges facing the IS strategy implementation. This has to do with the ability to implement the system on the established time and with the less amount of risk. From the same vein, Ossai and Degoke (2014) reported that only 16% of all projects are delivered on time and within their budget.

Conclusion

An excellent management has a powerful effect that leads to align Information system strategies with the goals of an organization, which is from the essential factors leading to IS success. Inadequate management is adequate reason to prevent the alignment between the information systems goals and those for organizations. So, goals and strategies must be determined accurately (Rishi, & Goyal, 2008). Some factors may help to overcome the management obstacles such as the following:

Making a robust relationship between top management and staff along with expressing the importance of successful implementation of ISS particularly in relation to collaboration will help to solve the problems of the weak management role in implementation as mentioned in the results of the survey.

According to the results the appropriate executive management support is essential in creation and implementation of the system to success and achieves ISS goals which have a high percentage of the management's issues.

Participation of employees in information system strategies, making a relation among employees and information specialists, participation and using interoperation teams in performing information system will help to overcome the challenges.

Rishi and Goyal (2008) suggested that Improving office design in the organizations to allow interaction with top management and communication between employees which may have an effect on the turnover of the employees.

Recommendations

The IS/IT and top management are responsible for the successful implementation of information system strategies. Therefore, the previous recommendations should be taken into account when implementing Information system strategies. Therefore, business managers need to negotiate with system administrators to explain what is relevant to their work. They need to collaborate closely by appointing a representative in the upper management meeting or coordinators from other departments and try to find solutions that align business needs with IT priorities, thus promoting greater organizational harmony. The organizations need to be aware of the issues associated with management to decrease the project's failure instead of spending more on operating systems. The policies of IT department should be flexible, able to change in response to new organizational requirements and business priorities.

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INFORMATION SECURITY MODEL USING TWOFISH ENCRYPTION AND DECRYPTION ALGORITHM

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Abstract

Cryptography has gained more attention from researchers due to the need to enable the security of messages sent over an unsecure network. Message sender want to ensure that only authorized receiver is able to interpret the message sent. So, even if a message falls in the hands of another person other than the authorized recipient, the message is still secured. This proposed system shows how a symmetric key algorithm (Twofish) is used to encrypt messages to make it secure when sent over the network. In this paper, the Twofish algorithm with a 16 bits character key length is implemented using JAVA programming language. The result is efficient because it gives a different ciphertext each time encryption is performed.

Keywords: Algorithm, encryption, ciphertext, Twofish Algorithm, Symmetric Key.

Introduction

Information security plays a pivotal role during internet communication in today's era of technology. It is tremendously important for people doing e-transactions (Shivangi, 2012). A lot of information ranging from texts, video streams, audios and others are usually communicated through the internet. Some of this information are important and private to individuals and organizations and should be kept away from outsiders, hence the need for information security. According to Sangapu and Gomatam (2014), the internet is a channel of communication between tens of millions of people and there is a great increase in its use even for commercial purposes. Due to these, security becomes a tremendously important issue to deal with.

Information Security is simply the process of keeping information secure: protecting its availability, integrity, and privacy. Mark (2013) in his book on information security thought of information security in the context of the three Ds: defense, detection, and deterrence - each of which is equally important. Defense reduces misuse and accidents, detection provides visibility into good and bad activities, and deterrence discourages unwanted behavior.

Information security uses cryptography to transform usable information into a form that renders it unusable by anyone other than an authorized user; this process is called encryption. Cryptography provides information security with other useful applications as well including improved authentication methods, message digests, digital signatures, non-repudiation, and encrypted network communications.

According to Shivangi (2012), cryptography is the practice and study of techniques used to secure communication in the presence of adversaries. It entails constructing and

analyzing protocols that disallow adversaries to influence information communication. Ayushi (2010) also refers to cryptography as the art of securing information by encoding messages so that they cannot be readable. The message to be sent is called a plaintext. The method of converting plaintext into unclear or unreadable text is called encryption. The encrypted (unclear or unreadable) text is called cipher text. The process of converting ciphertext back to plaintext is decryption. Encryption and decryption would not take place unless there is an algorithm that does the conversion of messages. According to Bruce (1996) a cryptographic algorithm (which is also referred to as a cipher) is a mathematical function used for encryption and decryption. Bruce further explained that the algorithm can be kept secret as in restricted algorithm. Restricted algorithms have drawbacks such as – the need to constantly change algorithm in order to block an unwanted user, unavailability of room for quality control and standardization, eavesdroppers' ease of purchasing product and learning algorithm and insecurity of algorithm if users are not good cryptographers.

However, generally known algorithms can be used with a key (which can be anyone of the large number of values). Cryptographic algorithms can be categorized into two depending on how key is managed – public key cryptography and private key cryptography. Public key cryptography is also known as asymmetric key cryptography while private key is also known as secret key or symmetric key cryptography (Sangapu & Gomatam, 2014). Symmetric key algorithms allow one key to be used for encryption and decryption while asymmetric key algorithms use different keys for encryption and decryption (Nivedita & Sapna, 2015). The RSA and Diffie-Hellman are public key algorithms. Symmetric key cryptographic ciphers come in two varieties, stream and block ciphers. Stream ciphers works on a stream of bits or bytes. Stream ciphers are used for securing data of terminal and wireless applications. Block ciphers performs encryption or decryption on fixed size block of data (Ranjeet, Vivek, Jibi & Rajni, 2014). Commonly used block ciphers are Data Encryption Standard (DES), Advanced Encryption Standard (AES), Blowfish, Twofish, Serpent, IDEA, RC4, CAST5 and so on.

In this paper, Twofish cipher is implemented to secure information. A messaging system is modeled using Twofish cipher to secure the message before they can be sent to their destination. The rest of the paper talks about review of related works on Twofish algorithm, methodology, results & discussion and conclusion.

Literature Review

A General Review of Information Security

Information security has been in existence a long time. This claim is illustrated by an event in the Dutch history. In January 1684, when a war commenced between the Dutch Republic and France; it seemed like the French were on the winning side so Stadholder Williams III, a semi-hereditary commander of the army and navy as well as chief executive of the foreign policy of the Republic was willing to fight the French in the Southern Netherlands. The French ambassador Count D'Avaux knowing this entered direct negotiations with the city council of Amsterdam in order to prevent that city from raising money for troops as the Stadholder had requested. The act of D'Avaux was a direct interference in the internal affairs of the Dutch State and it was an uncommon thing for a French ambassador to do.

However, the Stadholder decided to shadow the ambassador's messenger at a time he was most likely carrying a letter on the negotiation to the King. He successfully attacked and robbed the messenger with the help of some Maastricht garrison horsemen leaving him with his boots and jacket. This affair caused much distress to the Amsterdam city council but D'Avaux reassured them that the letter was fully coded and that no one could read it without a key.

On 16th February 1684, Stadholder entered a meeting with the Amsterdam city council with the decoded copy of the letter, accusing her of treason. D'Avaux could only help the Amsterdam by pretending that William's cryptanalyst had interpreted the letter wrongly by producing a different copy (which he claimed was the genuine letter) of the letter for circulation. To counter this, William III released a copy leaving out many unsolved code groups at first, and later released a full version plain text accompanied by the solutions from other letters which were intercepted at the same time and which were compromising. With this, William was able to counter D'Avaux lies (Story by Kurtz G.E in Willem III en Amsterdam). The incident made William III who was to ascend the British throne in 1689 well aware of the benefits of intercepting mail. Mail interception became a trending weapon against opponents. It is information warfare at its best (Karl & Jan, "n.d."). According to Singh, Vaish and Kumar (2014), at the close to the 20th century, increase in computer networks gave rise to the Internet, the first manifestation of a global network of networks. Due to the dominant increase in networked computers in computing, there came a need to secure computers physically and the information stored on it, as it is more exposed to threats on the internet. Internet security of this day was discussed by some researchers.

Today, the Internet has brought millions of unsecured computer networks into communication with each other. Our ability to secure each computer's stored information is now influenced by the security on each computer to which it is connected.

The rapid growth and widespread use of electronic data processing and electronic business conducted through the Internet, along with numerous occurrences of international terrorism, fueled the need for better methods of protecting the computers and the information they store, process and transmit. Governments, military, corporations, financial institutions, hospitals, and private Businesses collect and store huge volumes of confidential information. The information may be about employees, customers, research, products or financial operations. Most of this information is collected, processed and stored on computers and transmitted across networks to other computers. If this information fell into the wrong hands, it could lead to lost business, law suits, identity theft or even bankruptcy of the business. With cybercrime on the rise, protecting your corporate information and assets is vital. Protecting confidential information is a business requirement, and in many cases also an ethical and legal requirement (Singh *et al.*, 2014). Cryptography is a major technique in information security.

Cryptography and its Classification

Cryptography can be classified based on different criteria. Based on time, it can be classified into classical cryptography and medieval (modern) cryptography.

Classical Cryptography

Once upon a time, keeping data secret was not hard. Few people were literate, the use of written language alone often sufficed to keep information from becoming general knowledge. To keep secrets then, you simply had to write them down, keep them hidden from those few people who could read, and prevent others from learning how to read. Deciphering the meaning of a document is difficult if it is written in a language you do not know (Mark, 2013). Mark (2013) explains that a new method of hiding information had to be adopted when reading and writing became common amongst people. Traditional ciphers were later adopted. Traditional ciphers used two techniques for hiding information from an intruder: substitution and transposition.

Medieval Cryptography

Modern cryptography is majorly subdivided into symmetric and asymmetric key cryptography.

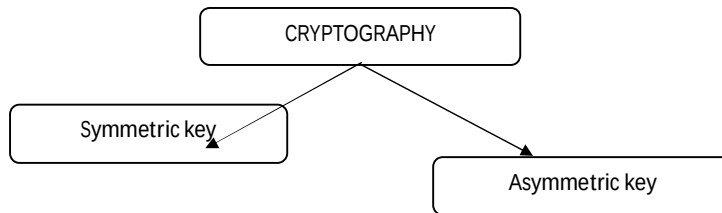


Figure 1: Modern cryptography techniques

Symmetric key cryptography: Cryptography involves two opposite actions-encryption and decryption. A key is combined with a plaintext to make it a ciphertext. Bruce (1996) claimed that the security of an algorithm is based on the key. In symmetric (which is also called secret key cryptography or private key cryptography), a single key is used for both encryption and decryption. As shown in Figure 2.2, the sender uses the key (or some set of rules) to encrypt the plaintext and sends the ciphertext to the receiver. The receiver applies the same key to decrypt the message and recover the plaintext. With this form of cryptography, it is obvious that the key must be known to both the sender and the receiver; that, in fact, is the secret. The biggest difficulty with this approach, of course, is the distribution of the key.

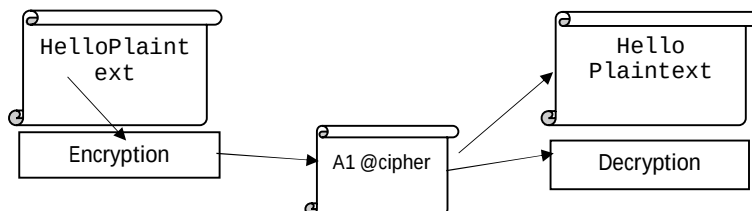


Figure 2: Symmetric key cryptography.

Examples of algorithms that use the symmetric key scheme are Data Encryption Standard (DES), Advanced Encryption Standard (AES), Blowfish, Serpent, Twofish etc.

Asymmetric key cryptography: This kind of scheme uses two keys. One for encryption and the other for decryption. The encryption key need not be kept private. It is known by everyone and used by everyone to encrypt their message hence making the scheme a public key. However a private key known only to the receiver is used to decrypt the message.

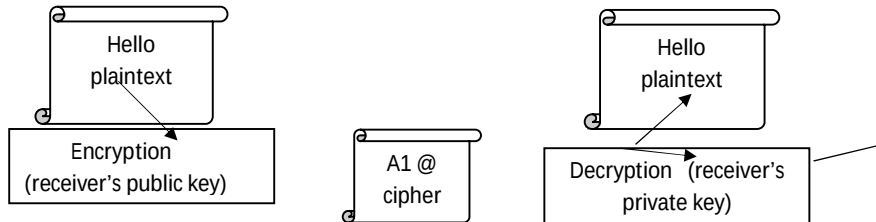


Figure 3: Asymmetric key cryptography.

Twofish Algorithm

The proposed system is designed using the Twofish algorithm. The Twofish algorithm is a 128 bits symmetric block cipher. It accepts a key length of 128-192 and 256 bits. Its structure is a Feistel network and it operates a 16 round encryption process (Bruce et al, 1998). Below are the steps involved in Twofish algorithm;

1. Plaintext (128-bit) $\xrightarrow{\text{Split using}}$ $P_0, \dots, P_3$ (32-bits each)

$p_0, \dots, p_{15}$

Split using

according to:

little-endian conversion

$$P_i = \sum_{j=0}^3 p(4i+j) \cdot 2^{8j} \quad i = 0, \dots, 3$$

2. Pre-whitening or input whitening - Each 32 bits is XORed with a 32 bits key to produce a whitening. (The result of whitening gives R_0, R_1, R_2 and R_3).

$$R_{0,i} = P_i \oplus K_i \quad i = 0, \dots, 3$$

3. 16 Iterations of round functions – This is a major stage in the algorithm. It is the body of the entire encryption process. The result of the input whitening – R_0, R_1, R_2 and R_3 are manipulated to produce new four 32 bits output. The following steps are carried out;

- i. The first two 32 bits (R_0 & R_1) are passed into an F-function to produce F_0 and F_1 .
- ii. F_0 is XORed with R_2 and the result is rotated to the right by one bit to give C_2 .
- iii. R_3 is first rotated to the left by one bit and the result is XORed with F_1 to produce C_3 .
- iv. The new result is R_0, R_1, C_2 and C_3 . The result is swapped (to give C_2, C_3, R_0 & R_1) before it passed into the next round.

$$\begin{aligned} (F_{r,0}, F_{r,1}) &= F(R_{r,0}, R_{r,1}, r) \\ R_{r+1,0} &= \text{ROR}(R_{r,2} \oplus F_{r,0}, 1) \\ R_{r+1,1} &= \text{ROL}(R_{r,3}, 1) \oplus F_{r,1} \\ R_{r+1,2} &= R_{r,0} \end{aligned}$$

$$R_{r+1,3} = R_{r,1}$$

for $r = 0, \dots, 15$ and where ROR and ROL are functions that rotate their first argument (a 32-bit word) left or right by the number of bits indicated by their second argument. This process is repeated 16 times, this is why it is called the Twofish rounds.

4. Output whitening – XORing with sub-key.

$$C_i = R_{16, (i+2) \bmod 4} \oplus K_{i+4} \quad i = 0, \dots, 3$$

5. $C_0, \dots, C_3$ of ciphertext $\xrightarrow{\text{little-endian conversion}}$ 128-bit ciphertext, c_i

Elements of Twofish

F-Function - The function F is a key-dependent permutation on 64-bit values. It takes three arguments, two input words R_0 and R_1 , and the round number 'r' used to select the appropriate subkeys. The results are achieved by doing the following:

- R_0 is passed through a g function, which yields T_0 .
- R_1 is rotated left by 8 bits and then passed through the g function to yield T_1 .
- The results T_0 and T_1 are then combined in a PHT (Pseudo Hadamard Transform) and two words of the expanded key are added.

$$T_0 = g(R_0)$$

$$T_1 = g(\text{ROL}(R_1, 8))$$

$$F_0 = (T_0 + T_1 + K_{2r+8}) \bmod 2^{32}$$

$$F_1 = (T_0 + 2T_1 + K_{2r+9}) \bmod 2^{32}$$

where (F_0, F_1) is the result of F.

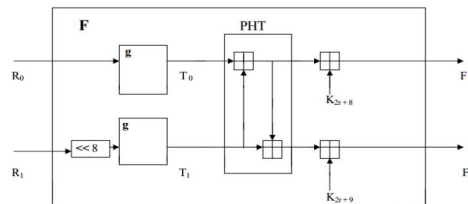


Figure 4: F-function

Function-G - The function g is the most important part of Twofish and forms the heart of the algorithm. The following are done in the function g:

- The input word X is split into four bytes.
- Each byte is run through its own key-dependent S-box. Each Sbox is bijective, takes 8 bits of input, and produces 8 bits of output.
- The four results are interpreted as a vector of length 4 over $GF(2^8)$, and multiplied by the 4×4 MDS matrix (using the field $GF(2^8)$ for the computations).

- The resulting vector is interpreted as a 32-bit word which is the result of g.

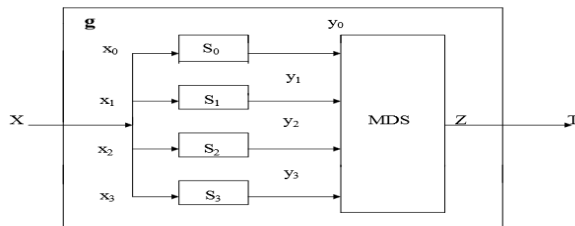


Figure 5: Function-G

S-BOXES - The s-box (substitution box) is a basic component of a symmetric algorithm used for substitution. In block ciphers, they are typically used to obscure the relationship between the key and the ciphertext. An S-box is a table-driven non-linear substitution operation. They vary in both input size and output size, and can be created either randomly or algorithmically. S-boxes were first used in Lucifer, then DES, and afterwards in most encryption algorithms. Twofish uses four different, bijective, key-dependent, 8-by-8-bit S-boxes (Bruce et al, 1998). Singh ('n.d') explains that each s-box consists of three 8-by-8-bit fixed permutations chosen from a set of two possible permutations q_0 and q_1 . Between these three permutations, XORed operations are performed with subkeys S_0 and S_1 . These subkeys are computed only once for a particular global key and stay fixed during the entire encryption and decryption process.

MDS Matrix - According to Wikipedia, an MDS (Maximum Distance Separable) matrix is matrix representing a function with certain diffusion properties that have useful applications in cryptography. An MDS code over a field is a linear mapping from a field elements to b field elements, producing a composite vector of a + b elements, with the property that the minimum number of non-zero elements in any non-zero vector is at least b + 1. Put another way, the "distance" (i.e., the number of elements that differ) between any two distinct vectors produced by the MDS mapping is at least b + 1.

PHT - Wikipedia describes a pseudo-Hadamard transform as a reversible transformation of a bit string that provides cryptographic diffusion. The bit string must be of even length, so it can be split into two bit strings a and b of equal lengths, each of n bits. The pseudo-Hadamard transform (PHT) is a simple mixing operation that runs quickly in software.

Given two inputs, a and b, the 32-bit PHT is defined as:

$$\begin{aligned} a' &= a + b \bmod 2^{32} \\ b' &= a + 2b \bmod 2^{32} \end{aligned}$$

Bruce et al (1998) however discussed that Twofish uses a 32-bit PHT to mix the outputs from its two parallel 32-bit g functions. This PHT can be executed in two opcodes on most modern microprocessors, including the Pentium family.

Key Schedule - The key schedule is the means by which the key bits are turned into round keys that the cipher can use. Twofish needs a lot of key material, and has a complicated key schedule. To facilitate analysis, the key schedule uses the same primitives as the round function.

Review of Related Literature

In 2016, Aparna *et al.*, did a study on the Twofish algorithm. It was concluded that encryption algorithm and the key schedule must be designed in tandem. Key should be as short as possible. It is much harder to design an algorithm with a long key than an algorithm with a secret key. Future work can be done to minimize the key and security transmits it to the receiver. In future Twofish can be used for other digital media files like image, audio, and video.

Gehlot, Biradar and Singh (2013), modified the Twofish algorithm using 128 and 192 bits and implemented it on VHDL (very high speed integrated circuit hardware description language). Their major aim was to efficiently implement a Twofish algorithm with the least delay and possessing high performance in terms of power and area used. The three used the software Xilinx 6.1 – xst and the language VHDL for their work. Xilinx software did the simulation of the modified process. Inputs were converted into binary form and given as input to the "Model-Sim Simulator" of Xilinx 6.1 xst, and in the output produced the RTL diagram, the waveform and the synthesis report, from which the values of delay and area were gotten.

All the modules and functions are interrelated hence, after modifying MDS and PHT, function g and function f also got modified. The results showed the delay of Twofish algorithm of 128-bit key and modified twofish of 128-bit key, delay results were compared. The analysis showed that modified algorithm has less delay than the conventional one. After that the delay results of Twofish algorithm with 192-bit key and modified Twofish with 192-bit key were compared. According to the results it was clear that modified 192-bit key Twofish algorithm has less delay than 192-bit Twofish. Gehlot and his colleagues also proposed that the algorithm can be implemented on sensor networks and ad-hoc networks on cross-layers in future. Also, the other modules of algorithm can be modified to reduce further delay.

Durgadevi, Selvanathiya and Sivasubramanian ("n.d.") in their work used the ALTERA FPGA device to implement a two fish algorithm considering only the 128 bits key length to make their work less complex. They improved the process speed of the Twofish cryptographic algorithm and designed it to be suitable for use in a wireless communication environment. Durgadevi and his colleagues further explained that MDS

block implemented in Twofish takes a lot of process time thereby making Twofish a slow algorithm.

Due to this, Durgadevi and others used the MDS-M2 (Maximum distance separable modulo-2) to control an increase of process time and reduce data process time. In conclusion, even though Twofish is slower than Rijndael, with the new MDS-M2, they claimed that the new Twofish cryptosystem algorithm by the simulation results confirmed a performance improvement of 11% than the existing Twofish algorithm. They concluded that the security system whose Twofish cryptographic algorithm used an improved MDS-M2 block is very suitable for wireless communication environment.

Mirza and Murphy (1999) made an observation on the key schedule of Twofish. They stated that key scheduling of Twofish has two properties that are contrary to claims implicit in the original submission of Twofish and could potentially be exploited. Firstly, both the pre- and post-whitening subkeys of Twofish occur with a non-uniform distribution, which gives information about the key. Secondly, the round subkeys of every reduced version of Twofish (that is, a version of Twofish with S0, S1) fixed occurs with a non-uniform distribution, which gives information about the key. An attack on any reduced version of Twofish would have cryptographic consequences for the full version of Twofish. For example, the unbalanced key schedule described in reduced Twofish may aid an attacker in deriving collisions if Twofish is used in a Davies-Meyer hash.

Singh ('n.d') claimed that Twofish is named due to the use of two main diffusion elements – MDS and PHT (Pseudo Hadamard Transform). (Moreover it is customary to name ciphers after sea-creatures and Twofish is the successor of Blowfish). Singh did a deeper analysis of its most significant diffusion element, the MDS matrix and proposed a VHDL model for the hardware implementation of the matrix. This he stated could be used to observe outputs that conformed the expected results from theory. Bruce *et al.* (1998) in their article on two fish claimed that Twofish was their submission to the AES selection process. They said that it met all the required National Institute of Standards and Technology (NIST) criteria—128-bit block; 128-, 192-, and 256-bit key; efficient on various platforms; etc.—and some strenuous design requirements, performance as well as cryptographic, of our own.

Methodology

Twofish algorithm is implemented using JAVA programming language. The system algorithm describes the step by step way of carrying out the precise problem. The proposed system uses two major algorithm which are reverse of each other. They are;

1. Encryption algorithm.
2. Decryption algorithm.

Encryption algorithm

The encryption algorithm is carried out as follows;

1. Examine the 128 bits block of input text and divide it into four 32 bits.
2. Whiten the input text by XORing each 32 bits with a 32 bits subkey.
3. Pass the first two 32 bits (R_0 & R_1) of the whitening into an F-function to produce F_0 and F_1 .
4. F_0 is XORed with R_2 and the result is rotated to the right by one bit to give C_2 .
5. R_3 is first rotated to the left by one bit and the result is XORed with F_1 to produce C_3 .
6. The new result is R_0 , R_1 , C_2 and C_3 . The result is swapped (to give C_2 , C_3 , R_0 & R_1) before it passed into the next round.
7. Step 3 to 6 repeated 15 more times using the swapped output of the preceding round.
8. The result of the final round is XORed with sub-key to produce an output whitening.
9. The final four 32 bits ciphertext is converted to a 128 bits ciphertext using the little-endian conversion.

F-Function Algorithm

The following are the steps carried out in the f-function:

1. Pass R_0 into a function-g to yield T_0 .
2. Rotate R_1 left by 8 bits and pass the result through a function-g to produce T_1 .
3. T_0 and T_1 are combined in a PHT.
4. The results from step 3 above are combined with two words of expanded key from the key schedule to give F_0 and F_1 which are the results of the f-function.

Function-G Algorithm

The following are the steps involved in the function-g;

1. The input word X is split into four bytes.
2. Each byte is run into its own key-dependent s-box.
3. Each s-box produces an 8 bits output which are passed through an MDS Matrix to produce a 32 bits output for the function-g.

Algorithm for S-boxes

The steps in s-boxes include;

1. Each s-box consists of a set of three 8 by 8 permutation chosen from a set of two possible permutation q_0 and q_1 .
2. XORs are performed between these three-permutation using the subkeys S_0 and S_1 to produce the result of the s-boxes and sent to the MDS matrix in the function-g.

MDS Matrix Algorithm

The following are the steps involved in MDS matrix;

1. Multiply a vector of four byte using the Galois Field (2^8) with the primitive polynomial, $x^8+x^6+x^5+x^3+1$.
2. After multiplication a 32 bits result is produced.

PHT

In the PHT, a simple transformation is done on a 32bits output using the equation below;
 $a' = a + b \bmod 2^{32}$ $b' = a + 2b \bmod 2^{32}$

Decryption algorithm

The decryption algorithm is a reverse of the encryption algorithm above so that encrypted messages when decrypted produces the same text as the ones encrypted.

Results and Discussion

This section discusses how the proposed system works. The proposed system does not share files between the networks. It also enables messages to be sent over the network.

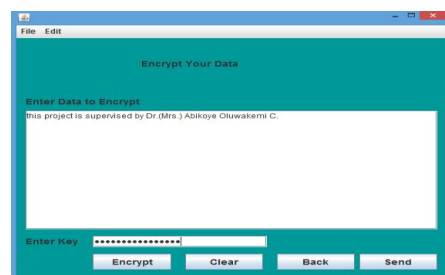


Figure 6: Plaintext with 16 characters key length

The encryption interface allows users to enter their text in plain form and enter an encryption key alongside. On clicking the encrypt button, the plaintext clears and is replaced with the ciphertext as shown in figure 7. The clear button allows users to clear the interface so that another data can be inputted. Once the send button is clicked, the message is sent to destination over the network as shown in figure 8.

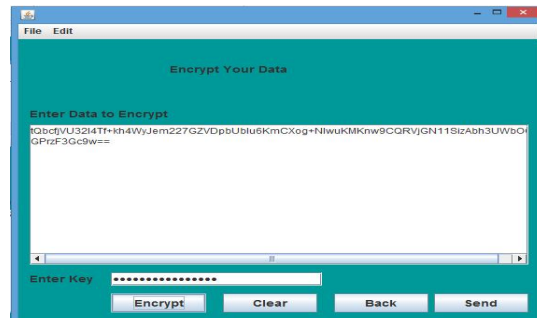


Figure 7: Corresponding ciphertext after encryption.

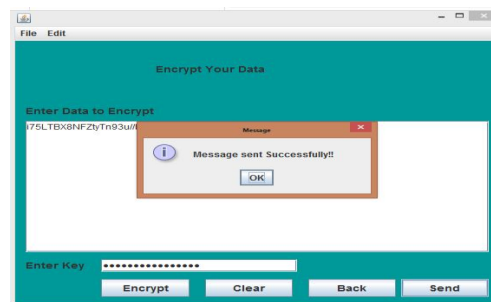


Figure 9: Sending of text

The Decryption Interface allows the user to decrypt ciphertext by clicking on the decrypt button after entering the correct key. If a wrong key is entered the user gets an incorrect text and is not able to get the real plaintext. New ciphertext can be decrypted by clearing old text and inputting new ones. On clicking back, the main menu appears. Figure 10 shows the corresponding plaintext after decryption using the correct key at the receiver side.

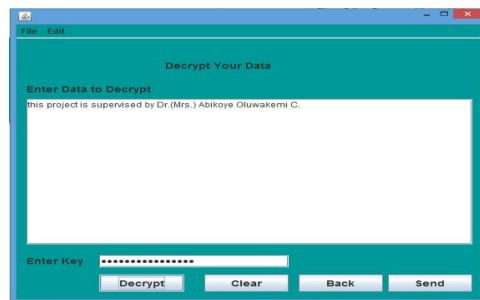


Figure 10: Corresponding plaintext after decryption

Conclusion

There are many messaging systems available for sending message from one end to another over the internet. Many of these systems lack message security. Unwanted people are able to read the messages without the permission of the sender or receiver. This is why this study is done to ensure that a medium which is enhanced with information security using Twofish algorithm is carried out. Twofish system is a private key cryptosystem that is based on confusion elements like MDS matrix, s-boxes, PHT, functions. In this work, a message security model was developed using Twofish algorithm with a single private key for both encryption and decryption, hence, it is symmetric encryption algorithm. The algorithm gives a different ciphertext each time encryption is performed using a different key. However, the disadvantages of Twofish algorithm includes its slow speed, and also it can send a limited file size and encrypts only text, many keys have to be generated for every message. Hybridization that is combination of two or more algorithms can be done to improve the efficiency and application of the system for securing data and information.

Recommendation

The proposed system is recommended for exchange of messages over the internet. The elements of Twofish are effective for diffusion and toggling of plaintext. Twofish elements can be improved by making adjustment in order to create a stronger encryption. Also, the elements can be improved so that the algorithm works faster. Further research could be done by hybridizing both symmetric and asymmetric algorithms in order to improve the efficiency and application of the system for securing data and information.

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EMAIL DATA SECURITY USING CRYPTOGRAPHY

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Abstract

Email has become one of the prominent medium of message transmission between web users. Thus, email security measures need to evolve from time to time in order to mitigate security threats which are also evolving and becoming sophisticated. This paper presents a study that proposed, implemented and evaluated the performance of an email security approach that utilizes the Rivest Shamir Adleman algorithm as an additional layer of security. The approach involves an application that converts messages into cipher text as a separate platform. The cipher text is transmitted as the original message on the email platform. Also, the cryptograph keys are transmitted between communicating users via another media such as mobile phone. The proposed approach is evaluated by measuring the accuracy of the message transmitted between users. It showed an average accuracy of 98% over all the scenarios examined.

Keywords: e-mail, security, Rivest Shamir Adleman (RSA) algorithm, cryptography, confidentiality.

Introduction

Security of vital information has been a major challenge facing man even before the advent of information technology. Controlling and safe guarding information and communication in this technology age is as important as controlling water in the desert (Ēlî Biham, 2007). Encryption is the transformation of message (data/information) into form unreadable without the secret decryption key. The purpose is to enforce the security of vital information from unauthorized access. It can be used to make data private; it helps in making an unsecured transmission channel serve as a secured means of communication.

Until the advent of computer, one of the main constraints of cryptography had been the ability of the code clerk to perform necessary computation often on the battle field - as the early use of encryption was in military- with little equipment. However, the fear of code clerk being captured by the enemy has made it essential to change encryption method and computer has greatly helped in this change.

Encryption can be defined as the process of converting plain text into cipher text that is incomprehensible but can be converted to its original comprehensible form by using a secret key. Encryption is one of the prominent ways to ensure electronic mails (email) and other important files on a network gets to their intended recipient without a third part getting to know the message content of the email or file. It would be insensitive to

underrate the part encryption technology plays in protecting our public and private networks. It is important because it safeguards not just e-mails but also medical records, confidential and corporate information, data on personal buying habits, legal documents, credit histories and transactions. Safeguarding data is essential to peace of mind in communicating business and personal information (Encryption and Its Importance to Networking Device, 2017).

As data sharing or distribution and data security becomes more important and integrity of data is becoming a nightmare, companies, individuals and organizations sought various ways to protect their information (Berry, 2008). The increase in the sophistication and complexity of the modus operandi of cybercrime and security bridging has necessitated the frequent evolution and innovation of security measures to combat the theft of information and compromise of the integrity of data. This paper proposes email security architecture that adds a security layer on the conventional emailing system so that the message from a sender is originally a cypher text generated using Rivest Shamir Adleman (RSA) cryptography algorithm.

The remaining parts of this paper are organized as follows: section 2 presents a background to the study and a review of related works in the area of email security. The proposed architecture is presented in section 3. The results of the application of the proposed system and a discussion of the results and the performance of the proposed approach are presented in section 4. Section 5 concludes the paper and presents some future area worth studying further.

Background and Related Works

Security Threat

Email should normally include simple tasks of sending and receiving information without any security measure, but several threats have made the need for data security in emailing system very necessary. Data security refers to protective digital measures applied to prevent unauthorized access to computer databases and websites. The focus behind data security is to ensure privacy while protecting private or corporate data. (Alex Biryukov, 2004). There are many different threats to computer systems in general and the data stored on them in particular. These threats increased considerably when computer networking started and with the internet, they have become one of the most important considerations in managing a computer system (Threats to Data Security, 2017). These threats include the following:

Hackers: Unless they are protected, computer system and its content are vulnerable to anyone who wants to edit, copy or delete file without the owner's permission, such individuals are usually called hackers. A study formulated by researchers at the Ponemon Institute, which measures data collection and information

security in the public and private sectors also determined that the number of hacked accounts belonging to individuals numbered at or near 432 million (Jessica, 2015).

Malware: Malware, short for **malicious software**, is designed to gain access to computer system without the owner's consent. The expression is also a general term used to describe a variety of hostile, intrusive, or annoying software. These software are sometimes incorrectly referred to as computer viruses. Malware is not the same as defective software that has a legitimate purpose but contains harmful bugs. The AV-TEST Institute registers over 390,000 new malicious programs every day. These are examined using the analysis tools: Sunshine and VTEST, and are classified according to their characteristics. An updatable visualization program represents the results of the current malware statistics in the form of visual diagrams. Figure 1 depicts the trend of increase in malware infection for over the last thirty years.

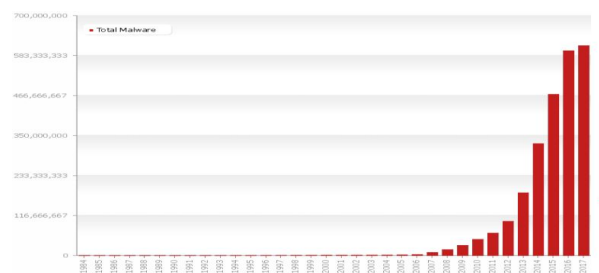


Figure 1: Malware spread (Malware Statistics and Trends Report , 2017)

Crime ware: This is a class of malware designed to specifically automate cybercrime. Its purpose is to carryout identity theft. It is most targeted at financial services companies such as banks and online retailers for the purpose of taking funds from those accounts or making unauthorized transactions to benefit the perpetrator controlling the Crime ware (Markus Jakobsson, 2008).

Spyware: spyware is a type of malware that is installed on computer and collects bits of information at a time about users on the network without their knowledge. It can be very difficult for a user to tell if spyware is on the computer. As many as 90% of U.S. home computers have been infected with spyware at some time and a majority of PC owners do not know how to solve the problem (Leath, 2004).

Virus: A computer virus is a piece of software designed to disrupt or stop the normal working of a computer. They are called viruses because like a biological virus, they are passed on from one infected machine to another and can self-replicate on the machine. Downloading software from the Internet, attachments to emails or using USB memory

sticks are the most common ways of a virus spreading or infecting computers. It accounts for 57% of the threats affecting data security (Brain, 2016).

Worms: A worm is a computer program, which can self-replicate and propagate over the network, with or without human intervention, and has malicious intent. It uses a computer network to send copies of itself to computers on the network and it may do so without any user intervention. It is able to do this because of security weaknesses on the target computer (Syed, 2009). Unlike a virus, it does not need to attach itself to an existing program. Worms usually cause at least some harm to the network, if only by consuming bandwidth whereas viruses corrupt or modifies files on a targeted computer.

Trojan Horses: Trojan horses are designed to allow a hacker remote access to a target computer system. Once a Trojan horse has been installed on a target computer system, it is possible for a hacker to access it remotely and perform various operations. The operations that a hacker can perform are limited by user privileges on the target computer system and the design of the Trojan horse, it is estimated that Trojan horses account for 83% of the worlds' malware infections (Radware, 2017).

Phishing: Phishing is an e-mail fraud method in which the criminal sends out legitimate- looking email in an attempt to gather personal and financial information from recipients. Typically, the messages appear to come from well-known and trustworthy Web sites. Web sites that are frequently spoofed by phishers include financial and commercial sites such as PayPal, eBay, MSN and Yahoo. A phishing expedition, like the fishing expedition it is named after, is a speculative venture in which the phisher puts the bait (fraudulent email message) hoping to fool at least a few of the prey that encounter it and take the bait. The criminal could then use the information to take money from the person's account for example. Cyber attackers are playing the long game against large companies, but all businesses of all sizes are vulnerable to targeted attacks. In fact, the number of spear- phishing campaigns targeting employees increased to 55% in 2015 (Internet Security Threat Report, 2016). The number of phishing website observed by APWG for example, increased 250% from the last quarter of 2015 through the first quarter of 2016 (APWG, 2016).

Cryptography

Cryptography is utilized in various applications and environments. The specific utilization of cryptography and its implementation will be based on many factors particularly to the computer system and its associated components. In general, cryptography is used to protect information while it is being communicated between two points or while it is stored in a medium vulnerable to theft (Coppersmith, 1994). In communication, cryptograph provides protection to data by enciphering it at the transmitting point and deciphering it at the receiving point. In file security, protection of data is by enciphering it when it is recorded on storage medium and deciphering it when it is read back from the storage medium. In the first case, the key must be available at the transmitter and receiver ends simultaneously during communication. In the second

case, the key must be maintained and accessible for the duration of the storage period (Hansche, 2005).

One of the most popular cryptography algorithms is the Rivest Shamir Adleman (RSA) (Wolf, 2008). RSA is a public key cryptosystem for both encryption and authentication that was invented in 1977 by Ron Rivest Adi Shamir and Leonard Adelman. It is the most widely used public-key cryptosystem today and has often been called the de facto standard (Frösen, n.d.). The operation of RSA is as follows:

Take a large primes, p and q and find their product in a PQ. Choose a number, less than n and relatively prime to $(p-1)(q-1)$ and find its inverse d , $\text{mod } (p-1)(q-1)$, which means that $6d \equiv 1 \text{ mod } (p-1)(q-1)$; 6 and d are called the public and private exponents respectively. The public key is the pair $(7, 6)$ and the private key is d .

The factors p and q must be kept secret or destroyed. It is difficult to obtain the private key d from the private key (n, e) if one could factor n into p and q . However, one could obtain the private key d . Thus, the entire security of RSA is predicted on the assumption that factoring is difficult (Howe, 2004).

RSA operations are all based on series of multiplications. In practical applications, it is common to choose a small public exponent for the public key. Entire groups of users can use the same public exponent. Algorithmically, this encryption is faster than decryption and verification is faster than signing in: public key operations take $O(k^2)$ steps, private key operations take $O(k^3)$ steps and key generation takes $O(k^4)$ steps, where k is the number of bits in the modules (Junod, 2001).

The security of RSA depends on the difficulty of factorization. There are several methods to try factoring, but as long as the keys are long enough there's small risk of having the RSA encoded messages broken. 384 bits can be broken relatively easily, 512 bits is probably unsecured and breakable by government personnel, 768 bits probably is relatively safe, 1024 bits should be secured for decades according to today's information, and 2048 bits will probably remain safe for a long time.

Email transmission

An email usually sent through an address in the form of mails are composed and sent on a client computer to an outgoing mail server through the Simple Mail Transfer Protocol (SMTP) server, which is like the local post office that checks postage, address and figures out where the mail should be sent. The SMTP server then contacts a Domain Name System (DNS) server for the interpretation of the domain. The DNS server translates domain names to IP address. It also checks if the domain name has mail exchange servers on it, which is required to know where the mail is supposed to go and if the receiver has facilities to receive it. With the proper information at the disposal of the SMTP, the message is dispatched from the SMTP to the desired domain exchange server called Mail Transfer Agent (MTA) which resolves the best place to put the mail. The mails are fetched using a client that operates through Post Office Protocol (POP) invented in 1984 used for downloading emails from a remote server or Internet Message Access Protocol (IMAP) invented in 1986, designed to allow remote access to emails stored on remote server (Sieber, 2012).

Emails are liable to information exposure. With access to certain tools, a third party can easily gain access to its contents (Toorani, 2008). Thus, in order to ensure privacy email encryption methods are adopted (Lee, 2013) using protocols such as Bitmessage, OpenPGP, Secure/Multipurpose Internet Extensions (S/MIME) and Transport Layer Security (TLS).

Most email clients offer support for the encryption protocols mentioned above, add-ons are also available to support specific type of protocol e.g. PGP Desktop email provides backbone for OpenPGP encryption (Geier, 2012; Henry, 2013). While these protocols and add-ons can protect messages, they also have their shortcomings:

- i. They can be very tough to use the intended way. Whitten (1999) showed that most users of PGP for example could not sign in and encrypt messages. In another study published by the same institution in 2005 when a newer version of PGP was available, showed that decrypting with the new version was easier, however, users still toiled with encrypting messages, verifying public encryption keys and revealing their own keys (Cranor, 2005).
- ii. With the difficulty that comes with encryption, most companies and individuals have automated the encryption process by using third party appliances and services. This takes the entire process out of the users' hands leaving it to configured gateway appliances to guarantee strict conformity with stated rules and security policies. The brunt of the whole process is however borne by the recipient who must use the same encryption gateway appliance which may not be readily available. Not being behind the same

encryption gateway means the recipient has to procure the public key each time a message is sent or log into a designated portal to gain access (Rivera, 2016).

- iii. Inconsistent implementation: Yahoo's automatic encryption connection between users and its mail service for example came into existence in 2014 with full support for HTTPS—SSL/TLS encryption over HTTP. Its implementation however seems inconsistent across servers and technically insecure in some cases (Geier, 2012).

The proposed system will provide a simple, friendly interface and environment for users to quickly sign in and encrypt/decrypt messages using easily verifiable keys between the sender and receiver of the message. The system will also be cheaper to use than most third party appliances and services with configured gateway because there will be no extra charge for keys each time a message is to be encrypted/decrypted. Its implementation is server independent thus making it consistent across different servers.

The pivotal article of (Babrahem, et al 2015) examined several solutions and standards that have been fashioned according to recent security requirements in order to enhance email security. They noted that some of the existing enhancements focused on keeping the exchange of data via email in confident and integral way while the others focus on authenticating the sender and prove that they will not repudiate from his message. The paper surveyed various email security solutions and introduced different models and techniques used to solve and enhance the security of email systems and evaluate each one from the viewpoint of security. Table 1 presents these studies and their strength and shortcomings.

S/N	Email security model	Author(s)	Strength	Weakness
1.	Developing a Model to Enhance E-Mail Authentication against E-Mail Address Spoofing Using Application.	(Zadgaonkar, S., Pandey, V.C. and Pradhan, P.S., 2013)	Authenticate the identity of the e-mail sender by checking the header field of the message	It requires the distribution of public keys and bidding them to their owners which is time consuming.
2.	Identity Based Email Sender Authentication for Spam Mitigation.	(Hameed, S., Kloht, T. and Fu, X.M., 2013)	Authenticate identity by providing signature to provide easy and reliable approach to combine the legitimate sender identity unambiguously to his e-mails	iSAT has low computational footprints and overhead is imposed.
3.	An SSL-Based Client-Oriented Anti-Spoofing Email	(Mooloo, D. and Fowdur, T.P., 2013)	Provide authentication by using cryptographic self-	To receive a confirmation

	Application.		signed certificates for a secure exchange	message, the client computers have to be authenticated alongside the e-mail turned on and the application must be running to avoid spoofing.
4.	Secure and Privacy-Enhanced E-Mail System Based on the Concept of Proxies.	(Kounelis, I., Muftic, S. and Loschner, J., 2014)	Protection of e-mails, including privacy of locations from which the e-mail system is accessed.	The proxy server represents a single point of failure, when it is fails, we need authentication of legitimate users. Implementation issue is complicated.
5.	CryptoNET: Design and Implementation of the Secure Email System.	(Ghafoor, A., Muftic, S. and Schmölzer, G., 2009)	Enhance e-mail system using certificates, smart Cards and crypto objects with high degree of Security for professional users.	The proxy server represents a single point of failure, when it fails we need a backup.
6.	Trusted Email Protocol: Dealing with Privacy Concerns from Malicious Email Intermediaries.	(Jang, J., Nepal, S. and Zic, J., 2008)	Parties involved can be trusted according to their TPM message.	Requires a paid key which can be expensive.
7.	Biometric-Based Security System for Plaintext e-Mail Messages	(Al-tae, M.A. et al 2009)	Ensures the confidentiality of email message plaintext using improved encryption authentication between the email sender and receiver using biometric features.	Exponential Relationship between the time used for the encryption/decryption and decryption algorithm ensures a certain plaintext size
8.	Stallings, W.	(Stallings, 2014)	Provides e-mails with confidentiality by using Symmetric block ciphering algorithm. The integrity is provided	The system can be initiated before inserting the E-Token

			using the SHA-1 and RSA. It uses three authentication techniques: password, Biometric authentication and E-Token to validate the e-mail account and the user. Non-Repudiation achieved using the bi-directional digital signature.	
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The models however could not effectively:

- i. protect emails transfer from sender to receiver via secure channel.
- ii. apply client-side security system to provide more of restrictions and to make effective and secure transactions.
- iii. consider other environments that use the e- mail systems. That is, they are not platform independent.

The main enhancements they founded are in two directions, which are the authentication of the email user identity and the confidentiality and privacy of the email transforming. They showed that these enhancements have improved the performance of the proposed systems and they reached a required level of security.

Hosnieh (2013) classified security approaches used in email system according to the protection mechanism provided by the email components. The latest developments in email security using cryptography were considered in details. They also described the use of these approached in the new generation of Internet Protocols IPV6 in comparison to the old Internet Protocol, IPV4.

Proposed System Architecture

The proposed email security architecture is depicted in Figure 2. It shows the conventional email system in which email messages are transferred between a sender client and a recipient client through email servers on the internet. In addition to this, is a computer program that initially transforms the original email message into a cipher text at the sender end and also transform the cipher text back to the original message at the receiver end.

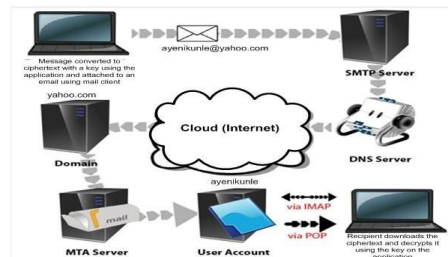


Figure 2: Proposed email system architecture

Figure 3 depicts the how the architecture is used to secure email messages.

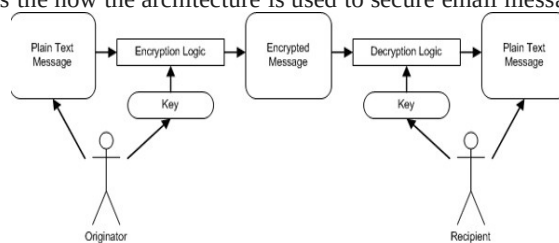


Figure 3: Encryption and Decryption of email messages

In this architecture, email messages are encrypted on the sender's computer using the RSA algorithm. The generated cipher text can be pasted as the email content or as an attached message and sent to the recipient. At the receiver's end, the recipient copies the email content or download the attached message and load it on the computer program for decryption purpose. The procedure for the use of the proposed email architecture is as follows:

Start

- Step 1: The sender composes the message to be sent with the application
- Step 2: The application encrypts it with a key using the application to create a cipher text.
- Step 3: The sender logs into a mail client.
- Step 4: The sender attach the cipher text to the mail composed with the mail client.
- Step 5: The mail along with the attachment is sent to the recipient.
- Step 6: An alternative means e.g. mobile phone is used to send the encryption key to the recipient.
- Step 7: The recipient logs into a mail client.
- Step 8: The recipient downloads the cipher text.

End

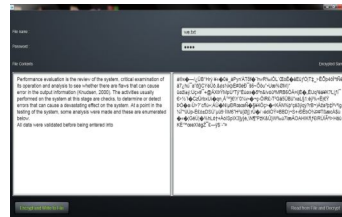
Suppose an encrypted Message, Msg. is to be sent to Kenny from Tai. Kenny will use Tai's public key (z, e) to calculate $\text{Msg.}^{**} e \pmod{z} = r$, where r is the cipher text. Kenny sends r to Tai. Tai then calculates $r^{**} w \pmod{z} = \text{Msg.}$ The value w is only known to Tai which means he alone can calculate $r^{**} w \pmod{z} = \text{Msg.}$ to recover the message.

This section presents the observed results in the application of the proposed e-mail security approach (presented in section 3) in sending emails. The performance of the approach is also evaluated and discussed.

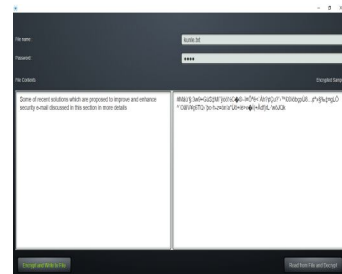
Several messages were prepared and sent using the approach proposed in the system architecture. Figures 4 (a) to (e) presents the prepared message and its corresponding cipher text at the sender's end.

File name	ProjectSample.txt
Password	*****
File Content	Encrypted Sample
My name is Ayten Aykunte Olusola, a PGDCS student with matric number 1568HCD11. This is my project and my supervisor is Dr. Amos Bajeji.	34A6...BU0J_ C...f7tJE-JE pDd+...J/8/5C4PCDj/aUzjaHnU/pA3-YLOisQeet PjheQ2H9-T4he7mJUAU4AZ' szN+811W8j C-6K'DZAU 0 +WQ' agIYHONQNZ
Encrypt and Write to File	Read from File and Decrypt

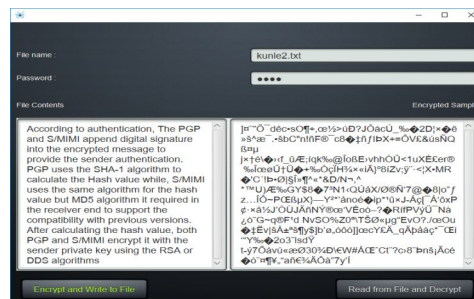
(b)



(c)



(d)



(e)



Figures 4 (a)-(e): messages and their corresponding cipher text in the proposed architecture

Discussion

Unlike the email security systems reviewed by Afnan (2015), the proposed architecture added another layer of security using a computer program that uses the RSA algorithm for the encryption and decryption of email messages. The message that will be sent over the network will be cipher text that will be near impossible to be deciphered by a third party who may get hold of the message. The RSA algorithm, known for its robustness, ensures the confidentiality of the message sent over computer network.

The performance of the system is measured using the accuracy of the received text transmitted over the network compared to the original text from the sender. Accuracy is measured using the following formal expression:

$$Accuracy = \frac{No. of words coorectly decrypted}{No. of words encrypted} \times 100$$

This measure gives the number of words correctly encrypted, transmitted and decrypted at the receiver end. Thus, it measures the performance of the proposed system in delivering email messages successfully.

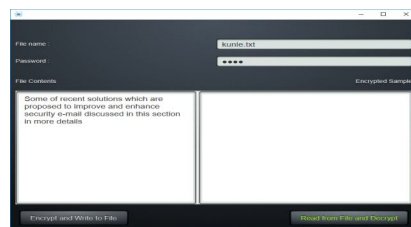
Figure 5 (a) and (c) gives instances measured during the evaluation of the proposed architecture. An average accuracy of 97% was recorded in the evaluation of the proposed approach over 20 examined scenarios.

(a)



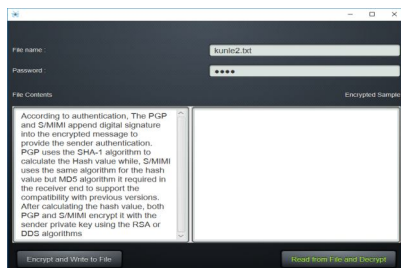
Number of words correctly decrypted = 82
Number of words encrypted = 83
Thus, **accuracy** = $82/83 \times 100 = 98.8\%$.

(b)



Number of words correctly decrypted = 19
Number of words encrypted = 20
Thus, **accuracy** = $82/83 \times 100 = 95\%$.

(c)



Number of words correctly decrypted = 76
Number of words encrypted = 75
Thus, **accuracy** = $82/83 \times 100 = 98.7\%$.

Figures 5 (a)-(c): Performance evaluation result

With the observed level of accuracy, the proposed approach shows a promising method for email security. Unlike in the reviewed approaches in the literature, the original message in this proposed approach is cipher text which can only be deciphered by the message recipients using a key that is transmitted via another medium such as mobile phone.

Conclusion

The issue of encryption should be stressed to eliminate eavesdroppers and hackers. The importance of encryption in information and communication transfer cannot be over emphasized as it has greatly prevented the theft of valuable information, protected the privacy of individuals and the organization at large. It is becoming more refined increasingly and highly secured (Biham, 2007). The use of cryptography in email messaging provides an enabling and secure environment for users to interact freely with friends, clients, families and associates without the fear of data/information leakage. It also helps in achieving the fundamental aims of computer networking. Without data protection, networking will be rendered porous and useless. However, one thing is certain, a good encryption system must have a very large factor, (i.e. the amount of time required by determined hacker to break it) such as 50 million years or more so that the time factor required breaking it becomes a discouraging factor.

This paper presents an architecture which provides an additional layer of security to the conventional system of email messaging. RSA algorithm is implemented as a computer program that will be used to encrypt and decrypt email messages by users. The application serves as an additional means of making messages sent over mail clients more secured and shows that cryptography is an excellent way of hiding contents of a message in a network environment. The encrypted message (cipher text) serves as the original message to be sent by the sender and received by the recipient who can decrypt the text into the comprehensible form of the message. The proposed system was empirically tested and proved to be reliable. The performance of the process was measured by computing the accuracy of the message delivered to the recipient compared to the originally message prepared by the sender. On the average, a performance of 98% accuracy was observed showing that the proposed architecture is reliable for message transmission between email clients.

Further study will focus on a wider performance evaluation of the proposed system using more users and over a wider area such as across states and regions. Also, the use of steganography to ensure confidentiality of the transmission of information via email will be carried out.

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AN ANALYSIS OF USERS' PERCEPTION OF PUBLIC LIBRARY SERVICES IN ILORIN, KWARA STATE, NIGERIA

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Abstract

This study focused on the users' perception of the public library in Ilorin, Kwara State, Nigeria. The objectives of the study are to find out the perception of the users of public library on various services provided by the library, the environment of the library, the administrative processes of the public library and conduct of staff of the public library to users. The data for the study was collected through structured questionnaire which was distributed randomly to 100 users within 3 days of the month of May, 2015 which was regarded as the peak period of the library by users. The data was analysed using tables and percentages. The major of the respondent of the study indicates that their satisfied with the reference service provided in the library, the perception of the users on the usage of library catalogue could not be ascertained because the majority of the respondents expressed that they are not using it to access library collections. The photocopying services provided in the library and the library collections were perceived by the users as being satisfactory. Other services like the notice boards, available reading tables and chairs were also perceived to be adequate. However, the toilet facilities in the library were perceived as being unsatisfactory. The environment of the library, particularly the tidiness and security in the library were seen to be adequate by the majority of the respondents. The respondents wish that the registration fee collected from users should be cancelled or reduced. The opening time and closing time were perceived as being satisfactory. However, the library handbook given to users was perceived as not being adequate to assist the users to understand the operation of the library. The conduct of the library staff was perceived to be satisfactory and majority of the users also perceive the library staff to be knowledgeable and have a good understanding of the library operations.

Keywords: Public Library, user's perception, Nigeria

Introduction

There are different types of libraries and one of the prominent among them is the public library. IFLA/UNESCO (2001) explained that public library is an organization which provides access to knowledge, information and works of imagination through a range of resources and services. Peculiarly, services and resources of public libraries are expected to be made available to all members of the community, regardless of race, nationality, age, gender, religion, language, disability, economic and employment status and educational attainment. Public libraries according to Bhatti,et.al (2015) play a significant role in developing informational system for lifelong learning of the general public. The author revealed further that public library can access the global information

by utilizing the virtue of information technology. The function of public library involve accusation of peer –reviewed journals and other information resources which can help the users to obtain quality information for research, improvement of education and knowledge. Public library is equally revealed to enhance adult education and also help to improve the literacy rate of its community (Akparobore2012).

A public library according to Kumara and Nikam (2012) provides all types of information services and utilizes its collections which usually include but not limited to reference information materials and Children literature and other collections that usually spread across all disciplines. They also indicated that the spread of public library in Nigeria started from Lagos to Western Nigeria and to Northern and Eastern Nigeria.

The Kwara State Public Library was established about fifty years ago. It has been moved from one location to the other, until 1990, when it was moved to its present location, which is at the heart of many government ministries and opposite the Central Bank of Nigeria, on a vast land of about 2 hectares and well-maintained environment in Ilorin, Kwara State Capital in Nigeria.

The library has different sections the catalogue section, automation unit, reading halls, study carrels, reference services. Other units available in the library include serials and government publications. There are notice boards placed at strategic places within the library complex. There are conference halls and other units like, children, physical challenge people, training rooms, business centers and the bindery. The library has sitting chairs and table for about 200 users at a time. Its services cover all categories of human being who want to seek information; hence it is usually refer to as the *people's university*.

The existence of public libraries cut across different continents of the world, though they could have emerged in different ways, their principle of existence is the same and it is to provide equal access to the library collections regardless of race, nationality, age, gender, religion, language, disability, economic and employment status and educational level (IFLA/UNESCO' 1994). Public libraries have users that are uniquely spread across all ages and genders, young and old people, students, civil servants, and people from different occupations and status. Hence, users of public library are of different educational levels, and socio-economic background. In view of these, the uniqueness characteristics of the potential users of public library cannot be over-emphasised. It is certain that each user will have different information needs and view about the administration procedure of the library, the staff conduct, the library environment and services provided by the library. Hence it is good to determine the users' perception of the state public library, so that the library management will be guided on direction to improve upon the status quo of the library (Literature on perception).

Objectives of the Study

The general objective of the study is to determine the perception of users of Kwara State Public Library on some of the operations and services rendered by the library. The specific objectives are to:

1. find out the perception of the users' of Kwara State Public Library on reference services provided by the Library.
2. determine the perception of the users of the Kwara State Public Library about the environment of the library.
3. determine the perception of users of Kwara State Public Library on administration processes of managing the Library.
4. find out the perception of users of Kwara State Public Library on staff conduct to users.
5. determine the perception of the users of the Kwara State Public Library on the adequacy library catalogue to access information in the library.

Literature Review

Past studies on perception and required improvement of libraries have been conducted on academic, special and public libraries. Kumara and Nikan (2012) conducted a study on perception of young adults towards city central library in Mysore public library services and among their findings was that majority of respondents were highly impressed with library opening hours. The respondents also showed good impression about public library amenities, which include adequate ventilation and lighting. Also in a study carried out by Zickuhr, et, al (2013) found out that vast majority of Americans ages 16 and above perceived that public libraries play an important role in providing free access to materials and resources, promote literacy and a love of reading and improve the overall quality of life in a community.

Kayaoglu (2014) conducted another study on perceptions and expectations of public library users in Istanbul, Turkey. The study was able to gather from the respondents that the main reason why they use the public library was to study and do their homework, hence it could be concluded that the most common reason for visiting a public library was to meet educational need. The result is consistent with the fact that most public library users in Istanbul are students. Saliu (2005) noted that there are substantial increase in the number of public libraries in some states of Nigeria and the author highlighted that over fifty percent of the states had established public library boards with Edo, Delta, Kano, Kaduna, Kwara, Imo, Anambra and Lagos States maintaining the lead. It was also revealed that public library is essentially a medium of education in Nigeria and it is noted that public libraries presently perform some roles to the nation's development. The roles include: provision of information for planning, provision of educational, information and facilities, provision of political information, supporting

different kinds of research work, provision of economic documents and organization of enlightenment programmes.

Iwhiwhu (2012) studied the users' level of satisfaction with public library of Edo State. Results indicated that respondents were not satisfied with information resources provided in the library. They did not show their satisfaction with the availability of text books, journals, CD-ROM services and other recreational materials available in the library. Study found that the library is not achieving its objectives in satisfying the information needs of its users. Findings revealed that users were satisfied with other than literary services provided in the library such as sitting plan, library space, air condition, photocopier service, lighting in the library, circulation and computer services.

Nzivo (2012) examined the public library system and information services in Kenya. Study used Survey technique questionnaire as a tool to collect data. Majority of the respondents were students (64.3 %) while other were administrator, businessmen, lawyers, accountants and information officers. Findings showed that OPAC of the library is widely used by the users to find the information, they were using library catalogue (15.2 %). Results also indicated that respondent's satisfaction with library services was (69.3 %). They were utilizing internet facility (63.3 %). They regarded the computer services in the library as very good (84.2 %).

Islam (2012) conducted focus group discussion to evaluate the library services in northern districts of Bangladesh. Study also highlighted the information needs of rural community. Respondents mentioned that they need information for education, health care, food and nutrition, family planning, agriculture information needs such as information about weather, soil, seeds, fertilizers and pesticides. They mentioned that they also need information about cultivation of vegetables and dairy development. They described that in leisure time they visit their neighbor or friends. They pointed out that they like to read books on poetry, text books, and books on religion, agriculture, poultry, biography and livestock. They were aware of the rural library services and use library for finding needed information.

Gallimore (1999) overviewed the challenges faced by public library managers and found that the change with the library science profession has changed the responsibilities of public library managers. Due to this change public library managers are facing issues such as use of technology in libraries, staff and services issues.

Pors (2010) analyzed the services for citizens by public libraries in Denmark. Study found that the library staff working in public libraries of Denmark welcomes the new work tasks. Library visitors in Denmark public libraries appreciated the provision of new services. They utilize the new services for acquiring required information.

Manjunatha and Shivalingaiah (2004) measured the customer's perception of service quality in libraries and found that customers of the library expect that library should offer good resources and services. Study found that the satisfied customer brings more users to the library. Study concluded that there is a need of leadership qualities in library staff for promoting library services to the customers.

Khan (2015) analyzed the users' perception of service quality of the Central Public Library Bahawalpur. The study found out that Central Public Library of Bahawalpur is offering good quality of services. The study concluded that library users are effectively utilizing library services and visit the library frequently. They are satisfied with different library collections and overall services provided by the library.

Methodology

In quest to ascertain the perceptions of users of Kwara State Public Library in Ilorin, the Kwara State Capital, a descriptive survey method, with self-developed questionnaire was used. The questionnaire which has open-ended questions consists of five parts, namely: the demographic characteristics of the users, services provided in the library, assessment of library environment, assessment of library administration procedures, and library staff conducts to users.

The demographic characteristics of users section consists of five questions. The section for services provided in the library has fourteen questions for respondents. The assessment of library environment has nine questions for the respondents. The assessment of administration procedure of the public library and staff conduct to users has eleven and four questions respectively for the respondents. The respondents were also given the opportunity to suggest ways the public libraries can be improved to meet the expectations of the users.

The copies of questionnaire were administered randomly to 100 users. The distribution was done over a period of three days and in the month of May, 2015 which is regarded as the peak period of library usage at public library in Ilorin (Kwara State Library Statistic Book, 2014; 2013; 2012). The influx is proportional to the period students prepare for their final examination conducted by West African Examination Council (WAEC) and National Examination Council (NECO). These two examinations are taken compulsorily by students in final year in secondary schools in Nigeria, so that they can have necessary academic requirements to gain admission into tertiary institutions of their choice. Other professional examinations conducted by Nigerian Institute of Management (NIM), and Institute of Chartered Accountant of Nigeria (ICAN), etc. are being prepared for at this period of the year by prospective candidates. Hence, this period allowed for contact with different categories of users.

From 100 questionnaire distributed randomly, a total of 81 questionnaire were returned, which represent 84% return rate. The return copies of questionnaire were analysed and explained through tables, percentages

RESULT ANALYSIS

Table 1. Demographic Characteristics of the Users

Variable	Frequency	Percentage (%)
Sex of Respondents		
Male	53	65.4
Female	28	34.6
Total	81	100.0
Education Status		
Student	61	75.3
Former Student	20	24.7
Total	81	100.0
Highest Qualification		
Ph.D	6	7.4
MSc	15	18.5
BSc	32	39.5
HND	6	7.4
NCE	4	4.9
OND	15	18.5
WASC or equivalent	3	3.7
Total	81	100.0
Usage of Kwara State Library		
Frequently	46	56.8
Very frequently	21	25.9
Occasionally	13	16.0
Rarely	1	1.2
Total	81	100.0

To conduct this study, structured questionnaires were distributed to users. The number of questionnaire distributed was 100, out of this, 81 responded to the survey. By this, it is established that 81% return rate was achieved. From the 81 respondents recorded, 53

(66.4%) of them were male, while female were 28(34.6%). In terms of the status of the respondents, the survey revealed that 61 (76.3%) of the respondents were students, and the other respondents which were 20 (24.7%) in number were former students. The implication of this is that most users of the public library are students in various categories

Also the survey requested the respondents to indicate their highest academic qualification. The finding obtained from them shows that, those with Ph.D. degree were 6 (7.4%), M.Sc. holders were 16(18.5%), and B.Sc. degree holders were 32 (39.5%). Also among the respondents were Higher National Diploma (HND) holders, this group were 6 (7.4%), holders of National Certificate of Education (NCE) were 4 (4.9%), holders of Ordinary National Diploma Certificate were 16 (18.5%), and 3 (3.7%) respondents were holder of West African School Certificate or its equivalent.

The findings on qualification of respondents show that the public library in Ilorin, Kwara State, Nigeria is used by highly educated people. From the table it be seen that Ph.D, Msc, Bsc, HND, NCE, OND, WASC or equivalents the use as spread more among Bcs, High National Diploma (HND) highest qualification.

Among 81 respondents that returned their questionnaire, 46 (56.8%) expressed that they use the library frequently, while 21(25.9%) revealed that they use the library very frequently. Also, 13(16.0%) confirmed that they used the library occasionally and only 1 (1.2%) of the respondents rarely use the library. Significantly, it can be observed that the majority of the respondents are those who visit the library constantly to consult the library collections to obtain information or to read or make photocopies in the library.

Table 2: Perception of Users on Service provided by the library to the users

Perception on Service Provided	Responses											
	Strongly Agreed		Agreed		Undecided		Disagreed		Strongly Disagreed		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
Users' satisfaction with reference service	21	25.9	39	48.1	15	18.5	3	3.7	3	3.7	81	100.0
Photocopy service quality	7	8.6	34	42.0	32	39.5	7	8.6	1	1.2	81	100.0
Library public catalogue is difficult to use	2	2.5	12	14.8	48	59.3	14	17.3	5	6.2	81	100.0
Library book collections meet users' information needs	14	17.3	47	58.0	13	16.0	3	3.7	4	4.9	81	100.0
Library has	10	12.3	7	8.6	14	17.3	13	16.0	37	45.7	81	100.0

adequate toilet facilities for users												
Library has contributed to my success	20	24.7	49	60.5	6	7.4	3	3.7	3	3.7	81	100.0

The respondents were asked to give their perception of the some of the services that are rendered to users in the library. Among the services highlighted, which users are expected to give their perception include: reference, catalogue, photocopying, book collections, reading space, available reading tables, chairs, arrangement of information items and the library notice boards.

The findings obtained from the respondents shows that 60 (74.0%) respondents indicated that they agree that the library provides satisfactory reference services, 15 (18.5%) of the respondents were undecided, 6 (7.4%) respondents expressed that they disagree that the reference services provided by the library was satisfactory. A close observation of the perception expressed by the respondents, shows that more than half of the respondents were satisfied with the reference services provided to them in the library.

The quality of work produced by a photocopying machine is usually accessed based on the quality of paper and clarity of the information on the paper. Hence, the respondents were expected to access the service they got from the library photocopying machine based on quality of paper used and clarity of information. The perception of respondents shows that 7 (8.6%) respondents agree that the quality of work is of high quality, while 32 (39.5%) respondents were undecided and 8 (9.8%) disagree that the quality of photocopying were of high quality.

The public library being studied has catalogue which serve as an index to the library collections. By the catalogue stand in the library, there are printed instructions to guide users, so that the usage of the catalogue can be easy for them. The response indicates that 14 (17.3%) of them which is expressed that they agree is difficult for them to use the catalogue. Among the respondents 48 (59.3%) respondents were undecided, whether it is difficult to use or not. The numbers of the respondents that disagree that the catalogue was difficult to use were 19 (23.5%). Based on the expression of the respondents, one can assume that the catalogue had not been too easy to use by the respondents.

Information dissemination through the library collection is usually one of the services expected in any library including the Public library; hence the respondents for the study were asked to express their view on how they perceive the library collections in respect to how it meets their information needs. The perception of the respondents shows that 61 (76.1%) of the respondents says they agree that the library collections meet their

information needs, 13 (16.0%) of the respondents were undecided, and 7 (8.6%) respondents disagree that the library collections met their information needs. From the perception of the respondents, it is observable that more than half convincingly expressed that the library collections met their information needs.

The perception of the respondents on the adequacy of toilet facilities for the library users was sought. The respondents perception was that 17 (20.9%) of the respondents agree that the toilets in the library were adequate for the use of library users. However, 14 (17.3%) of the respondents were undecided on adequacy of the toilet facilities and 50 (61.7%) respondents disagree on the adequacy of the toilets in the library complex. The perception of the majority of the respondent is more of expression of dissatisfaction with the toilet facilities in the library complex.

On the impact of the library on the users, 69 (85.2%) of the respondents expressed that the use of the library has contributed to the success they have achieved in their life endeavor, 6 (7.4%) were undecided, and 3 (3.7%) of the respondents also strongly disagree, thereby expressing that they cannot associate their use of the library to any success they attained in life. From the view expressed by the respondents, more than 60% of them perceived that their use of the library has contributed to success they have achieved in their life endeavor.

Table 3: Perception of Respondents on the Environment of the Library

Perception on Environment of the Library	Responses											
	Strongly Agreed		Agreed		Undecided		Disagreed		Strongly Disagreed		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
Library environment is noisy	2	2.5	6	7.4	3	3.7	32	39.5	38	46.9	81	100.0
Library does not have enough light for reading	3	3.7	10	12.3	6	7.4	29	35.8	33	40.7	81	100.0
Security provided in the library is not adequate	12	14.8	14	17.3	9	11.1	28	34.6	18	22.2	81	100.0

Distraction of any type is not allowed in the library. This will reduce the level of distraction in the library. It is on the basis of this principle that the respondents for the survey were asked to give their perception on whether the library environment is noisy or not. In their response 8 (9.9%) of the respondents strongly agree that the environment of the library is always noisy, 3 (3.7%) respondents were undecided, and 70 (76.4%) disagree that the library environment is noisy. The perception of the respondents is that the library environment is not always noisy Light, whether sunlight

or from electricity, is vital for efficient use of the library, based on its importance, the perception of the respondents on the quality of light that is always available in the library, was sought for. Among the respondents 13 (16.0%) agree that the quality of light is always poor, 6 (7.4%) were undecided, but 62 (76.5%) respondents disagree that the quality of light is always poor. The perception of the majority of the respondents was that the quality of light available in the library is bright enough for reading.

The public library is built on a vast land, users of the library and other facilities in the library do park their cars and cycles in the premises, apart from this, the information resources in the library are expected to be secured. The users also are expected to have a feeling of secured environment for themselves and their properties. Hence, respondents were asked to give their perception of the quality of security provided in the library and its environment. The responses generated on this shows that 26 (22.1%) of the respondents agree that the security provision at the public library is not adequate, while the 9 (11.1%) respondents were undecided, and 46 (56.8%) disagree that the security is not adequate.

Table 4: Perception of Users on Some Administrative Policies of the Public Library

Library Handbook Helped me to Understand the use of Library	Responses											
	Strongly Agreed		Agreed		Undecided		Disagreed		Strongly Disagreed		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
Library Handbook is useful to understand use of the library	19	23.5	33	40.7	16	19.8	9	11.1	4	4.9	81	100.0

The Public Library used for the study has a handbook which contained information to guide users on the operations of the library. A user upon registration, and at regular intervals, when a library staff on duty feels a user needs to obtain information from it, they are directed to read and familiarize themselves with the operations of the library. This study also finds out the perception of the users about the relevance of the handbook to them, while using the public library. The responses obtained from them shows that 42 (64.2%) of the respondent strongly agree that the handbook has helped them to understand the use of the library, 16 (19.8%) respondents were undecided, 13 (16.0%) disagreed that the handbook has not helped them to understand the use of the library.

Table 5: Staff Conduct in the Library to Users

Staff Conduct in the Library to Users	Responses											
	Strongly Agreed		Agreed		Undecided		Disagreed		Strongly Disagreed		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
Library staff are always around to help users	29	35.8	41	50.6	4	4.9	5	6.2	2	2.5	81	100.0
Library staff are very polite when talking to users	31	38.3	44	54.3	0	0.0	3	3.7	3	3.7	81	100.0
Library staff are knowledgeable	30	37.0	39	48.1	5	6.2	4	4.9	3	3.7	81	100.0

Human Resources are important component of any establishment. However, in an establishment that is service-oriented and deals with the public, the conduct of the staff in such establishment may be a factor to determine the extent the public utilizes the services of the establishment. In recognition of this, the perception of the library users on the conduct of staff to users formed part of this study. The study tried to find out if the library staff are always around to help library users. The perception of the users from the survey shows that 29 (35.8%) strongly agree that the staff of the public library are always around to help the library users.

Also, 41(50.6%) of the respondents agree that they are always helped by the library staff, 4 (4.9%) respondents were undecided, 7 (8.7%) respondents disagreed that they do always receive help from library staff whenever they require it.

One of the things a customer using a particular product is likely to expect from the marketer of the product is that he should dignify him as a user of the product. Similarly, a user of the library shall expect that the staff in the library should relate with him cordially. In a study carried out by Shivvalingalah, (2004), the researcher measured the customer's perception of service quality in libraries, among his findings was that satisfied users brings more users to the library. Based on this background, this study seeks to know the perspective of respondents on how the library staff relate with them as users. The response from the respondents indicates that 75 of them (92.6%) strongly agree that library staff conduct themselves politely when they interact with users, 3 (3.7%) of the respondents were undecided, and 3 (3.7%) disagreed that the staff are not polite in their conduct to library users.

The perspectives of library users on the level of knowledge and skills library staff do display while performing their official duties were given by the respondents. 69 (85.1%) respondents agree that the staff are knowledgeable, 5 (6.2%) of the respondents were undecided, and 7 (8.6%) disagree on the view that the library staff are knowledgeable.

Discussion

The findings of the study revealed that more than half of the respondents were satisfied with the reference services provided to them in the library. The study also revealed that the quality of photocopying is of low quality which indicates that the users are not satisfied with the photocopy service. Based on the expression of the respondents, one can assume that the catalogue had not been too easy to use by the respondents. From the perception of the respondents, it is observable that more than half convincingly expressed that the library collections met their information needs. The perception of the majority of the respondent is more of expression of dissatisfaction with the toilet facilities in the library complex. From the view expressed by the respondents, many of the respondents perceived that their use of the library has contributed to success they have achieved in their life endeavour

The study also revealed that the library environment is not always noisy. It also revealed that majority of the respondents were of the notion that the quality of light available in the library is bright enough for reading. Also, from the study, it was revealed that the security provided in the public library is adequate. This is noticeable with the obvious sight of security personnel within the library premises and the library complex has perimeter fence.

This study also finds out the most of the respondents' consent that the Library Handbook has been of great usage to them to understand the use of the library. The study found out that the library staff members are always not always available to help library users. It also revealed that, however, shows that whenever the staff members of Kwara state library is available they render help to their users. The findings revealed that staff members of Kwara State library are polite and it shows that their level of knowledge is high.

Conclusions

The public library according to Kumara (2012) is a very important Institution which provides number of services and information requirement of all types to her users. The general objective of this study is to determine the perception of users of the Ilorin, Kwara State, public as it affects services provided in the library, the environment of the library, administration processes and staff conduct to users of the public library.

The perception of the users on the services provided in the library shows that majority agree that the library provides good reference services. Also the perception of respondents on the difficulty in the usage of the library looks undecided as majority of the respondents were undecided on whether the catalogue was difficult to use or not. Also, majority of the respondents seems to perceive that the photocopy services provided in the library as cheap. From the respondent's perception, the library collection

is perceived to meet the information desires of the users. Also, the library is perceived to have enough reading space and the tables and chairs are also perceived to be comfortable for reading and sitting. The library notice board is also perceived to be of help to users. However, the library toilet was not perceived as having the standard that is perceived to be adequate to users. Generally, majority of the respondents perceive the library as an institution that has contributed to their success in their life endeavor.

The perception of the users on the environment of the library were pleasant, particularly on tidiness of the shelves, minimizing noise that can cause distractions to users, and the available light was perceived to be bright enough for users to read. The security provision for the library environment was perceived by many of the respondents as not being adequate. The administration of the library was perceived as being satisfactory, except in areas of registration fees collected by the library which many of the respondents wish it could be reduced or cancelled. Also, a large number of the respondents perceived the library handbook as not being adequate enough to assist them to understand the use of the library. The staff conduct to the users was satisfactory particularly in the way they help and talk to users. Also the library staffs were perceived to be knowledgeable and found to be decent in the way they conduct themselves.

Recommendation

After the conclusion of this study, the researchers recommend that Kwara State Government should further be encouraged to support the library management to sustain the cleanliness of the library environment to make more pleasant to users. It is also advised that necessary training and encouragement in terms of remuneration should constantly be given to all categories of library staff, so that they can sustain and even improve on their conducts to users.

It is also recommended that urgent approach to improve the security of the library collections within the library should be put in place and better security system outside the library hall should be provided to guarantee the properties of the users like cars and motorcycles.

The public library management should make a renew effort to educate library users at short regular intervals on different aspect of the library that will facilitate the use of the library particularly the use of the catalogue. Users should not be allowed to find out information alone from the library handbook.

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