WIDE AREA NETWORK IMPLEMENTATION ISSUES IN SMALL AND MEDIUM SCALE ENTERPRISES

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ABSTRACT

The paper addresses the implementation issues of wide area network (WAN) in small and medium scale enterprises (SMSE). Networked computers play great role in the daily operations and activities of mankind in the areas of e-education, e-businesses e-banking, e-healthcare, etc, both in government, public and private enterprises. The work explains the most important role that computer networks, specifically the WAN play in the daily operations of SMSE environment. Today's computer hardware and software production are ideal for web transactions because it is being designed to allow huge numbers of user applications rapidly and simultaneously access the same data without interfering with each other. The study examines the basic technology behind WAN implementation, and use of virtual private network (VPN) technology to implement a WAN that connects the Head Office of an SMSE to the Branch Offices. It concludes with analysis of findings and recommendations.

1. Keywords: Information technology, SMSE, VPN, WAN

1.0 INTRODUCTION

A Wide Area Network (WAN) is a computer network covering multiple distance areas and multiple smaller networks, such as local area networks (LANs) or Metro Area Networks (MANs). The world's most popular WAN is the *internet* [1]. The key difference between WAN and a LAN/MAN is scalability [2], hence, WAN must be able to grow as needed to cover multiple cities, even countries and continents. WAN may be privately owned or rented from a service provider. A set of switches and routers are interconnected to form a WAN, using both packet switching and circuit switching technologies. Packet switching allows users to share common carrier resources so that the carrier can make more efficient use of its infrastructure. In a packet switching set-up, networks have connections into the carrier's network, and many customers share the carrier's network. The carrier can then create virtual circuits between customers' sites by which packets of data are delivered from one to the other through the network. Circuit switching on the other hand allows data connections to be established when needed and then terminated when communication is complete. A good example of circuit switching is Integrated Services Digital Network (ISDN). When a router has data for a remote site, the switched circuit is initiated with the circuit number of the remote network. Virtual private network (VPN) is a technology widely used in a public switched network to

provide private and secured WAN for an organisation. VPN uses encryption and other techniques to make it appear that the organisation has a dedicated network, while making use of the shared infrastructure of the WAN. With this capability, files can be shared from the head office of an organisation to the branch offices online and real time. This is why SMSE should make use of this technology in other to improve produc-tivity and service delivery.

This work investigates how WAN implementation issues affect the operation of SMSE. With advancements in networking, companies may forget the lessons of the past. From the early days of the telephone, through automated switching, packet switching in gigabytes/terabytes, optical fibre, and wireless messaging, people seem to make the same mistakes in terms of lack of attention to cost of ownership, reliability, security and availability. Data networks have brought a whole new way of doing business to the world, permitting rapid transmission of information. This is why most organisations spend large sums of money to implement faster and more reliable networks. With business and economic globalisation, people are required to collaborate more closely, frequently and across greater distances. At the same time network implementers have been consolidating service delivery into data centres. Data centre consolidation offers large economic efficiency but places greater distance between data, applications and end users, putting great strain on application performance. WANs have historically been implemented in a piecemeal fashion with little or no regard for delivering consistent WAN services among sites. At a time when WAN performance needs to be optimised and tuned as carefully as Local Area Networks (LANs) performance, it unfortunately is more difficult than ever to accomplish. This trend, if not addressed, will invariably have a negative impact on application performance and corporate productivity, especially among WAN-connected branch offices, larger corporate sites and data centres. The overall goal of this work is to unravel the various means in which users can transact business through the help of Wide Area Networks, the benefits derivable from their use and how they can be used to enhance the operations of SMSE. The study explores whether WAN implementation could actually improve customer service effectiveness and employee productivity.

2.0 BACKGROUND STUDY

A computer network consists of two or more autonomous computers that are connected together in order to: share resources (files, memory, printers, modems, etc), share application software, and allow electronic communication among users, increase productivity. Computer networks are generally classified as:

- Local Area Network (LAN): The network that spans a relatively small area.
- Metropolitan Area Network (MAN): The type of computer network that is designed for a city or town.
- Wide Area Network (WAN): A net-work that covers a large geographical, different cities, states and even countries.

The topology of a network is the graphical arrangement of the computer systems in the network. Common topologies include a bus, star, ring, and mesh. The protocol defines a common set of rules which are used by computers on the network that communicate between hardware and software entities. Networks are generally classified as *broadcast networks* and *point-to-point networks* [3]. Broadcast networks have a single communication channel that is shared by all the machines on the network. Messages sent by any machine are received by all the machines on the network. The packet contains an address field, which specifies for whom the packet is intended. All the machines, upon receiving a packet check for the address field, if the packet is intended for itself, it processes it and if not

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the packet is just ignored. Point-to-point or switched, networks are those in which there are many connections between individual pairs of machines. When a packet travels from source to destination it may have to first visit one or more intermediate machines. Routing algorithms play an important role in point-to-point or switched networks because often multiple routes of different lengths are available.

2.1 WAN Technologies

WAN technologies generally function based on the international standard organisation (ISO) model network architecture. This model is known as the reference model of open systems interconnection (OSI) [4]. The OSI model has the following seven layers:

(1) *The physical control layer*: This is the level of electronic connections, signal transmission and data in raw binary form.

(2) *The data-link layer*: The level at which data is transmitted in units using suitable protocols to control and check correct transmission.

(3) *The network layer*: The level that provides the control between adjacent sending and receiving points in the network. The sending and receiving points that are able to switch transmission are "nodes" in the network.

(4) *The transport layer*: The level that handles an end-to-end service between the host computers it deals with addressing, error controls and regulated data transfers.

(5) *The session layer*: This level handles the establishment of connections between hosts and the management of the dialog. Messages crated at this level are addressed by the transport layer and split into packets at the network layer.

(6) *The presentation layer*: The level that handles the standard forms for presenting data e.g. the layouts used for VDU displays.

(7) *The application layer*: The level that the user has control over in determining what data is to be transmitted and how it is to be sent or received.

Virtual Circuits

A virtual circuit is a logic circuit created within a shared network between two network devices. Two types of virtual circuits exist: *switched virtual circuits*, and *permanent virtual circuits* [4]. Switched virtual circuit (SVCs) is virtual circuits that are dynamically established on demand and terminated when transmission is complete. Communication over an SVC consists of three phases: circuit establishment, data transfer and circuit termination. The established phase involves creating the virtual circuit between the source and destination devices. Data transfer involves transmitting data between the devices over the virtual circuit. Circuit termination phase involves tearing down the virtual circuit the source and destination devices. SVCs are used in situations in which data transmission between devices is sporadic, largely because SVCs increase bandwidth used due to the circuit establishment and termination phases, but it decrease the cost associated with constant virtual circuit availability. Permanent virtual circuit (PVC) is a permanently establish circuit that consists of one mode data transfer. PVCs are used in situation in which data transfer between devices is constant. PVCs decrease the bandwidth use associated with the establishment termination of virtual circuits, but it increase costs due to constant virtual availability. PVCs are generally configured by the service provider when an order is placed for service.

Modem

A modem is a device that interprets digital and analogue signals, enabling data to be transmitted over voice-grade telephone lines. At the source, digital signals are converted to a form suitable for transmission over analogue communication facilities. At

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the destination, these analogue signals are returned to the digital form.

CSU/DSU

A channel service unit/digital service unit (CSU/DSU) is a digital-interface device used to connect a router to a digital circuit [4]. The CSU/DSU also provides signal timing for communications between the two devices.

ISDN Terminal

An integrated services digital network (ISDN) terminal adapter is a device used to connect ISDN basic interface connections to other interfaces, such as EIA/TIA – 232 on a router [4]. A terminal adapter is essentially an ISDN modem, although it is called a terminal adapter because it does not actually convert analogue to digital signals.

2.2 Principles of WAN Implement-ation

WANs generally help connecting numerous smaller networks, including LANs and MANs. WAN is expected to be stretched because of the requirement to cover multiple cities, even countries and continents. Some WANs are immensely widespread across the globe, but the majority does not supply accurate worldwide exposure in terms of coverage and connection. The features of the communication amenities direct to an importance and prominence on competence of communications techniques in the devised plans of WANs. In implementing a WAN, the following guiding principles are employed:

(a) Deploy consistent WAN services: The offices and aggregation routers being installed must share a common software image/code base to deliver WAN services across the WAN.

(b) Consider WAN services during branch application design: When developing applications for the branch offices deployments, consider WAN attributes such as bandwidth and WAN services to ensure application performance and resiliency. In short consider that the WAN is a critical component in application life cycle.

(c) Consider the WAN as an end-to-end application delivery service: Avoid viewing a branch office as a point on the network, but view the WAN as a comprehensive application delivery platform. This will move it away from point product discussions and toward an architect solution, which will hasten development and improve perform-ance.

(d) Deploy embedded WAN services first, then special appliances: Before deploying an essential WAN Service such as security, and WAN optimi-sation, etc., first consider if the WAN service is embedded into an existing branch office and aggregation routing platform.

(e) Appliances last resort: If a WAN Service is not available as an embedded service within branch and/or aggregation router only then deploy the appliance. When comparing WAN services as an appliance versus an embedded service, only deploy the appliance in the case where there are specific features or functions that are must haves and not available in the embedded WAN Service.

(f) Broadband first: For new branch offices, seek broadband connections first before alternative WAN transport services.

2.3 Virtual Private Networks

With technology and business requirements changing at a rapid pace and the continued need for financial savings, many Information Technology providers are being asked to explore alternatives to traditional connectivity as a method of reducing their operating costs. One of these alternatives is virtual private networks. A Virtual Private Network (VPN) is a way to use a public telecom-munication infra-structure to provide remote offices or individual users with secure access to their organization's network at a much lower cost. VPN uses

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leased lines but connects remote sites through an internet service provider (ISP) to the organization's central data center. The VPN infrastructure creates a secure, private tunnel between the remote and host sites for secure data transmission over public lines. This reduces mileage fees associated with the leased lines as all long distance traffic is transferred over the internet instead. Data security is maintained by using several forms of data encryption and user validation technologies.

Virtual Private Networks can be constructed using several different methods. The most common forms are software, specialized stand-alone hard-ware, router add-ons, or hosted by the ISP. Software requires a computer to be used at each end that runs the VPN package. This method is the most flexible, but could be quite costly due to the cost of the server hardware requirements. Specialized stand-alone hardware or equipment uses VPN hardware at each site which links the computers at each site together and routes the data onto the internet to VPN equipment at the central site. This method is cost effective and simple to maintain. Network Router add-ons are similar in function to the stand-alone hardware, but the add-ons can only work with specific high-end routing equipment. Generally unless the routing equipment has already been deployed in the enterprise, the purchase of a router simply for VPN use is not cost-effective. If however a supported routing device is already in use, VPN services can be added to the existing hardware at a cost comparable to the stand-alone hardware system, but without the need for extra hardware boxes as the VPN services run inside the routing equipment. These solutions tend to be faster and highly reliable, though more complicated to configure. An Internet Service Provider hosted VPN takes the technical management out of the system. The ISP makes changes, manages the system and has control over the tunnel that is created. Unfortunately this leaves organizations that use a VPN as an essential core piece of their backbone vulnerable to the common issues of outsourcing; little stake hold in the performance and reliability of the system by the consultants.

There are three primary VPN technologies in use today: Trusted VPNs, Secure VPNs and Hybrid VPNs. Secure and trusted VPNs are not technically dependent, but they can co-exist. Trusted VPNs implies that the customer trusted the VPN provider to maintain the integrity of the circuits and to use the best available business practices to keep from snooping on traffic traveling on the network. As the popularity of the internet grew, security became more of an issue. Trusted VPNs offer no real security, and vendors started to create protocols that would allow traffic to be encrypted at the edge of one network or at the originating computer, moved over the internet like any other data, and then decrypted when it reached the corporate network or a receiving computer. These types of networks are referred to as *secure VPNs*.

2.4 Small and Medium Scale Enterprises (SMSE)

There is no generally accepted definition of a small and medium business because the classification of businesses into large-scale, medium-scale, or small-scale is a subjective and qualitative judgement [6]. A small-scale enterprise is defined as a firm with few staff. In countries such as the USA, Britain, and Canada, small-scale business is defined in terms of annual turnover and the number of paid employees. In Britain, small-scale business is defined as that industry with an annual turnover of 2 million pounds or less with fewer than 200 paid employees. In Japan, small-scale industry is defined according to the type of industry, paid-up capital and number of paid employees. Consequently, small and medium-scale enterprises are defined as: those in manufacturing with 100 million Yen paid-up capital and 300 employees, those in wholesale trade with 30 million yen paid-up capital and 100 employees, and those in the

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retail and service trades with 10 million yen paid-up capital and 50 employees [6]. In Nigeria, there is no clear-cut definition that distinguishes a purely small-scale enterprise from a medium-scale enterprise. SMSE is therefore defined by the National Council of Industries as business enterprises whose total costs excluding land is not more than two hundred million naira. In South Africa the term SMME, for small, medium and micro enterprises, is used. Elsewhere in Africa, MSME is used for micro, small and medium enterprises.

In many economies, SMSE are also responsible for driving innovation and competition. In the European Union, SMSE comprise approximately 99% of all firms and employ between them about 65 million people. Globally SMSE account for 99% of business numbers and 40% to 50% of their gross domestic product (GDP). In India, the SMSE sector plays a pivotal role in the overall industrial economy of the country. It is estimated that in terms of value, the sector accounts for about 39% of the manufacturing output and around 33% of the total export of the country. Further, in recent years the sector has consistently registered higher growth rate compared to the overall industrial sector. The major advantage of the sector is its employment potential at low capital cost. As per available statistics, this sector employs an estimated 31 million persons spread over 12.8 million enterprises and the labour intensity in the sector is estimated to be almost 4 times higher than the large enterprises [6].

3.0 MATERIALS AND METHODS

The study made use of interpretive research methodology in order to answer the overall question: *How can WAN implementation be used by SMSE?* This method is an action type of research method that generally makes use of data collection method such as case study, interview, and participatory observation. This approach is considered the best for obtaining result from Information Technology (IT) professionals and business community who are connected to WAN. Selected IT professionals and owner-managers of SMSE operators were interviewed. The questions for the interview are opened ended questions with the aim of giving respondents the opportunity to express their own experiences. The study will mainly use qualitative analyses to analyse the data. This method allows the subject to share their experience more freely.

3.1 Research Design

Professionals and SMSE managers were interviewed in a total of five companies of SMSE category that have branches in at least four locations outside their head offices and have implemented WAN wholly or partially. Specifically, five ICT professionals/engineers and five SMSE owner-managers were involved in the interview. Purposive sampling procedure was used for this study by choosing some IT SMSE firms as case study. Purposive sampling demands that researchers think critically about the parameters of the population being studied and choose sample case carefully on these bases. The following were the criteria used in the sampling:

- People in ICT as professionals;
- People and or firms that use computer or configured/implemented a WAN.

3.2 Instrumentation

Interview questions were selected carefully, they were designed to gain an understanding of WAN, ICT and general computer/computing knowledge and usage within the specific SMSE and to discover, if WAN is in use, and how it is implemented. The questions asked were open ended with the objective that they will be answered in detail as needed. All the interviews were conducted face to face with all the participants. Secondary data was collected from documentation. The documentation includes the internet, books on WAN, VPN design books and manuals and how WAN implementation affects SMSE. The compo-nents used in the design/implementation

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were also assembled and used to established connectivity.

3.3 Data Analysis Technique

The questions asked during the interview were divided into the following logical groupings:

(a) Workforce knowledge: To understand the workforce employed by SMSE;

(b) Current state of WAN implementation in SMSE: To establish the current status of WAN implementation usage within SMSE and to establish the technology used to implement it;

(c) Awareness of WAN implementation components: To establish the aware-ness of WAN implementation and knowledge of WAN implementation components procedures and cost and its benefits to SMSE;

(d) Decision making with regards to WAN implementation: To establish decision-making process as regards WAN implementation within SMSE, Who makes decisions? What is WAN implementation based on?

(e) WAN implementation barriers: To establish the barrier that prevents WAN implementation;

(f) Current processing of information/ transmission of data to remote branches: To establish how SMSE process and transmit information to remote branches of the organisation

4.0 RESULTS: ANALYSIS AND FINDINGS

4.1 Workforce Knowledge

All the Respondents have a workforce within the required range as discussed in the definition of SME. The number of employees ranges from 10 to 70. The employees have qualifications ranging from Senior School Certificate to tertiary education. This could imply that an SME requires some level of literacy, but the problem is that some respondents indicated that their employees were not computer literate.

4.2 Current State of ICT within the SMSE

Almost all of the respondents agree that their businesses use some form of IT or WAN technology. This seems almost impossible in the light of the above discussion on the high levels of computer literacy, but the use of user-friendly tools such as telephone, fax and credit card machines facilitate the use of WAN in this circumstance. Some view technology as important in their businesses, which includes stand-alone computers for internal purposes, as well as network environment in more technology-based companies.

4.3 Awareness of ICT

Almost all the respondents have some sense of understanding of WAN and what the benefit of implementing WAN might be, but not enough. They do not know the details of WAN implementation.

4.4 Decision-Making Process with Regards to ICT

All the respondents indicated that they are the main decision makers in their business with regard to all decisions, including WAN implementation. All of them indicated that when there is a need for technology implementation, they go to IT shops to get advice or they ask friends and family experts. The danger with this approach is that they rely on sales people do not have any knowledge of their business to advise them on their IT decision. This kind of information will not be strategic, and in line with the business goals. This reflects the lack of IT specialists in the SMSE. All the respondents have dedicated computer operating staff and only the technical companies have expert technicians to maintain the WAN and all IT issues. They used their networked environment to provide services and sharing of resources and WAN for on-line transactions.

4.5 Barriers

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The respondents listed different barriers that prevent them from adopting or implementing WAN ranging from socio-economic issues to technology-related issues: lack of money, power cuts, lack of knowledge, possibility of fraud, high cost of ICT equipments, etc. The listed barriers are very much in line with the literature, with the addition of power cuts as a new barrier that is probably unique to Nigeria. Most of the barriers could possibly be overcome by learning more about WAN implementation, SMSE employing knowledgeable ICT staff, etc.

5.0 DISCUSSION OF RESULTS

The responses from the SMSE IT professionals reflect the need for further investigation on how SMSE can achieve understanding of the knowledge economy and the effect of WAN implementation on it. The majority of the participants agreed that to a large extent they rely on IT to run their businesses. They have basic IT technologies implemented at their busi-nessses, such as telephone devices, and some have internet access. But only few of them know a few components that make up a WAN how they implemented. The answers reveal that the implementation of WAN was not done from a strategic point of view, but rather on market forces. This situation is aggravated by the fact that most of the SMSE are managed by the owners, who make all the decisions in the business, and do not have experiences or knowledge of IT. There is therefore the need for SMSE proprietors to employ IT specialists, or get consultants to advise the SMSE them on implementation issues of WAN-related matters at a strategic level.

On the current sate of WAN implementation within the SMSE, the study shows that some basic technologies such as telephones, fax and standalone computers are already implemented for some sections of the business, but WAN connectivity and mobile technologies still need to be increased. The SMSE recognise that technology is an important part of their clients' lives. The findings reveal the fact that current technology on WAN implementation is not planned but random. In terms of the awareness of ICT, the study revealed that SMSE do not know much about the WAN implementation principles and that they know very little about implementing WAN. This is in agreement with the literature, which highlights lack of knowledge as a problem. Businesses rely on information in order to make informed decisions that will give them a competitive advantage.

The decision-making process is one sided. This confirms the literature that the owner is the centre of the SMSE business, making all or most of the decisions. This is a weakness, as indicated in literature, because the owner-managers of the SMSE are the decision makers in all aspects of the business, including IT, without necessarily having proper knowledge of the IT environment. The owner-managers' capability gaps or knowledge gaps, intuitive or organic styles, and motivations will influence his or her decisions. Planning the WAN implementation is essential if any business wants to implement it successfully. The barriers that were highlighted as major problems in Nigeria are lack of knowledge about both the strategic use of WAN and WAN as a concept. Generally, SMSE cannot afford expensive skills, whether WAN implementation or otherwise, because of their small turnover and limited budgets. Other problems include the ever-changing IT environment, lack of trust/confidence in ICT, security, power problems, etc. The problems result to customers experiencing delays because the systems are offline, which destroy the benefits that technology should bring to businesses. Most of the benefits of WAN implementation come from the data captured from the customer, such as personal details and transactions details. The new economy is termed "knowledge economy" because of heavy reliance on information and data that is turned into knowledge or intelligence. This knowledge is used by businesses to help

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their decision-making processes. By keeping records of transactions, a business can learn and discover new information about the customers. Business intelligence can be used to develop the competitiveness of the business, which is a drive for implementation of WAN.

5.1 Considering VPN Technology

Virtual Private Networks have become increasingly important in enter-prises that require multiple office connectivity and desire a reduction in their overall costs of doing business. They have the potential to greatly reduce costs associated with Wide Area Networking and to change the face of networks permanently [7]. They are capable of getting data from point A to point B quicker and less expensive than previous technologies. Using a local Internet service provider dial-up line saves an estimated 60-80% over toll-free remote access server lines. Cisco Systems estimates that an organization with 1000 dial-up users and 3000 users on an 800 number, with an average number of hours online of only 5 per week per user, will save anywhere from $376,000 per month to $481,000 per month [8]. The savings depends on whether a hardware, software, or router solution is chosen. In addition, there is an estimated 20-40% savings over dedicated leased lines due to the elimination of long distance communi-cation charges required for traditional Wide Area Networks. Adding users to the Virtual Private Network is also very simple requiring little time, while adding users to a direct dial-up solution can take months [7].

5.2 Management and Organizational Implications of VPN

Virtual Private Networks are used to provide an organization with many competitive advantages. Moving to VPN architecture creates additional centralization and the ability to manage users and connections around the world from a single site. The management utilities available with a VPN allow for network managers to make changes centrally without the need to touch desktops. It is used to connect remote offices or branch offices to the central office to maintain database consistency. It is also being explored as a means for third parties, such as consumers, partners and suppliers, to connect directly to the organization for updates, accurate product information, ordering and billing and a variety of other online tasks [8]. It is considered as a remote access solution for employees who travel or are off-site often and require access to the central site. The increasing security and extensive cost savings make VPNs an essential ingredient to a successful, low-cost network.

5.3 WAN and VPN Equipment Compared

WANs and VPNs use different equipment. Wide Area Networks require traditional routers and some sort of wide area connection that connects two or more sites together directly. This can be frame relay, ATM, point-to-point, or many other types of connections. The lines are centralized at one spot and connect to the infrastructure hardware. Virtual Private Networks connect using VPN devices [9]. These can be hardware or software devices that are placed at both sides of the connection. Sometimes the connection is established using software on the users' systems and hardware on the VPN equipment at the host. There are entire software-to-software solutions, however they are generally less efficient and may not be as secure.

5.4 VPN Benefits

There are several benefits to using Virtual Private Networks. There is inherent reliability in use of the internet that transfers to VPNs. Low equipment mean time between failures is another benefit, as is the wide selection of vendors available. Authentication and encryption technology advances have also aided in adding benefit to the system. VPN technology has also advanced to provide better encryption, more reliable service and more users per device than ever before.

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Competition increasing and VPN standardization in many companies has increased the opportunity for better equipment at less expensive prices. VPN equipment takes less physical room than in the past, and provides better service and reliability [9] [10]. The potential cost savings for companies using Virtual Private Networks in place of traditional Wide Area Networks is significant.

6.0 CONCLUSION AND RECOM-MENDATIONS

The paper provides an answer to how a WAN implementation can be used by SMSE, based on a new economy known as the "knowledge economy". WAN implementation is a multi-disciplinary subject and an enabler for global business in different ways, including: general (for administrative purposes), production-integrating (to support business processes and the production of goods and services), market-oriented (for marketing purposes, and increasing the company presence on the web). The implementation of WAN should take into consideration that SMSE are different and have different needs. It is important for an SMSE to implement solutions that are specific to its needs. A number of barriers make it difficult for SMSE to implement WAN, such as lack of knowledge/awareness, lack of necessary skills, perceived high setup cost, the constantly changing IT environment, and particularly unsteady power supply in Nigeria. These problems are both socio-economic and technological. SMSE should therefore take advantage of various emerging technologies provided by mobile communication technologies. The number of cell phones with 3G or high-speed networks has increased. This is a market which the SMSE could be exploiting. The following recommendations are suggested for WAN implementations:

- Consistent WAN optimisation and performance routing;
- VPN and WAN Scalability;
- Integrated Management: Network management that integrates WAN services configuration, trouble-shooting, fault isolation as well as security management including threat reporting, compliance reporting, constant audits, a means to monitor application performance;
- Application of encryption/security across different branches, data centres and head office;
- SMSE proprietors should be involved in ICT related workshops and seminars to increase their knowledge base;
- Government should encourage SMSE by having a team of professionals to constantly educate SMSE proprietors and employees on the use of modern ICT systems.

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