MODELLING OF DOWNTIMES OF OPERATING SYSTEM OF TELECOMMUNICATION FACILITIES FOR EFFECTIVE PROJECT COMMUNICATION AND MANAGEMENT INFORMATION SYSTEM

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ABSTRACT

Project Management Information System (PMIS) and communication facilitate the processes through which project objectives are achieved. This study examines and analyses the major contributory factors to downtimes of modern communication facilities using Global System of Mobile Telecommunication (GSM) operations in Nigeria as a study background. The downtimes of GSM facilities hamper free flow of information and communication needed for time and resource constrained unique tasks which characterize project management. Opinion research and renaissance survey were adopted. Data was collected through questionnaire administration modeled in likert five point scale. Computer-based multiple regression analysis through statistical program for Social Science (SPSS) software, version 15 was used for data analysis. The result of the data analysis formulated a predictive model for evaluation of downtimes of operating GSM facilities. The result of data analysis also indicates that erratic, unreliable and incessant power supply, breakdown of site transmission equipment and base transceivers station; in significant ranking order; are the major contributory factors to downtimes of operating GSM facilities. In order to dampen their effects on PMIS and timely communication flow, so as to facilitate project success, recommendations were made for predictive maintenance, provision of back-up or redundancy systems, capacity building and introduction of the principles of fail-safeing concept in the operation and management of GSM facilities.

Keywords: *PMIS, GSM facilities, project communication, power supply outage, site transmission equipment, people failure, force majeure, safe-failing.*

INTRDOUCTION:

Telecommunications and information technology is fast reducing communication barriers especially in project management in which time and resources are constrained, with challenging tasks and organizational structure. Project management attempts to achieve project mission objectives within these specified constraints. Information plays an important role in binding the building blocks of modern multi-division, multi-location project and multinational organizations. It should be noteworthy that all over the world, the economy is either in shamble, in a state of comma or in a state of chaos due to lack of sufficient, timely and effective flow of information. Since its invention, modern information communication has been helping project managers to have relatively faster access to the databases, whether centralized or distributed. Not only that information accesses faster, but everyone can obtain up-to-date data, and post their own inputs for others to use without delay, and hence information sharing among the project teams and other stakeholders. Information communication facilitates project success objectives vis-à-vis, scheduled completion within budget and quality standard. Information communication is usually shared among various groups working at the same geographical site by local area network (LAN). The data may be maintained on a central computer (server) and accessed and updated by users from different terminals (clients). Terminals at different sites may be connected to the LAN through modems and communication lines. This could make the information accessible and easy-to-update from remote locations. LAN's at different sites may be connected with each other through wide area network (WAN). In such systems, part of the information may be held centrally and part may be handled only at the LAN at project sites. Internet, a large area network with open distribution system now offers facilities for disseminating information over geographically dispersed areas. It is basically being used for electronic mail, group discussion-users networking, long distance programming and data access, and file transfer of information. Eluwa-Benson (1998) describes communication as an art or science of transmitting information, ideas, and attitudes or opinions from one person to another, or from one group to another through a common system or symbol.

Modern business and project management rely on state of art information and communication technology of Global System of Mobile telecommunication (GSM) facilities. Project Management Information System (PMIS) through GSM facilities often experience service difficulties. Though, the introduction of GSM services was meant to cushion the excruciating experiences in project communication, they are being characterized by frequent erratic, unreliable and inefficient project communication, which often constrain success objective. There has been incessant downtimes and idle times of operating GSM facilities usually due to breakdowns and other causes. Service difficulties such as no network coverage, network busy, unavailability of number etc are rampant thereby making reliable information communication system service delivery elusive. The salient factors responsible for downtimes of operating GSM facilities have not been determined and evaluated for mitigation and remedial actions. The objectives of the study are to:

- Explore the time utilization of operating GSM facilities so as to ensure seamless efficient and reliable information flow in project management.
- To develop a predictive models by identify and examining salient factors responsible for downtimes of operating GSM facilities so that concerted efforts should be directed towards mitigation, immediate detection and corrective action for both improved service delivery and effective project communication and information management.

The findings from the study will help in enhancing PMIS and project communication network for successful project delivery. To the crew members of GSM service providers, the study will help them to identify and put into check the salient causes of downtimes and breakdown of GSM facilities for apt maintenance policy and reliable information service delivery needed by project team members and other customers.

The following hypothesis is formulated and tested for the validity of the model.

Ho: The downtimes of GSM facilities due to aggregate and individual breakdown related factors are not significant for effective PMIS.

LITERATURE REVIEW

Project communication management is one of the processes through which the project objectives are achieved. It involves generating, collecting, disseminating and storing of project information. According to Schwable (2006), many experts agree that the greatest threat to the success of any project is a failure to communicate. He posits that many project managers say that 90 percent of their job is communicating and avers that many project managers fail to take time to plan for project communication. Even though having a plan does not guarantee that communication will flow smoothly, it certainly helps. Cadle and Yeates (2008) observe that in addition, there is another subtle feature of project like information system development that involves considerable complexity. This is that the members of the team need to communicate with each other, to share information and to coordinate their effort. Project communication and PMIS facilitate the realization of project objectives, and therefore so indispensable that every project should include a communication plan. The essential information and communication services needed for effective project management are usually threatened by the downtimes of the operating communication system, vis-a-vis the GSM facilities

Modern PMIS which is usually interfaced with GSM network is an integrated user-machine system that provides information to support operations, management and decision making functions relating to planning and control of project objectives (Chitkara 2006). Renaissance survey indicates that PMIS infrastructures rely heavily on GSM facilities for optimum performance. Downtimes could be attributed to incessant breakdowns and failure of component parts and myriad of other contributory factors.

HISTORICAL BACKGROUND OF GSM SERVICE DELIVERY IN NIGERIA

Infrastructure projects such as telecommunication and power projects are capital intensive, multiple equipment-oriented works and involve large quantity of component parts and sub-assemblies. They are usually designed by specialized engineering firms and consultants. The art of telecommunication has evolved over the years and a breakthrough in terms of harmony in specifications was achieved by a committee originally known as Group Special Mobile (GSM) set up by posts and telecommunication departments of European countries. The success of the committee culminated in the replacement of the different analogue systems of telephony in use around the 80's with a harmonized digital system generally referred to as the GSM technology.

The GSM revolution in Nigeria began in August 2001 and changed the fact of information and communication technology. Although only three GSM licenses was issued by the Nigerian Communications Commission (NCC) after the initial round of bidding by interested companies, the demand for GSM services which has the most penetration in the Nigerian mobile telephony market and enhanced competitive advantage saw the licensing of two more companies. There are currently five licensed companies – Zain, MTN, Globacom, Mtel and Etisalat delivering GSM technology services to the Nigerian people. GSM services in Nigeria are characterized by incessant downtimes leading to poor quality service delivery to customers, especially to project managers due to time and resource constraints and complexity of tasks at various phases of the life cycle. All GSM companies provide almost similar services to subscribers but quality of service differs from company to company with most subscribers opting for more reliable and efficient service providers. The Nigerian Communications Commission (NCC) rates the performance of the GSM companies on Quality of Service (QoS)- a figure calculated from the values of performance indicators such as Call Set-up Success Rate (CSSR), Drop Call Rate (DCR) and Hand-Over Success Rate (HOSR). Consistent high QoS value is a roadmap to withstanding the ever increasing competition for market share in the Nigerian mobile telecommunication industry. However, QoS is adversely affected by incessant network failures due to breakdown of facilities as well as inadequate network coverage among others. Adequate maintenance of GSM facilities puts equipment in good working condition and is essential to achieve acceptable QoS values. Breakdown of GSM facilities and equipment result in downtime, expensive emergency repair costs, heavy revenue losses and impaired corporate image. Considering the technological complexities associated with GSM facilities and its relatively uncharted waters in Nigeria, this study provides an insight to the types of breakdown and their causes through downtimes analyses.

Chandra (2006) asserts that project financiers in telecom projects evaluate among others; the equipment supply contracts. Such contract is judged for pricing competitiveness, flexibility to re-negotiated prices, upgradeability of equipment being supplied and the terms and conditions of payment. Substandard equipment and spare part would not auger well for the development and smooth operations of GSM facilities. Though failures of facilities are inevitable and unpredictable as they are chance variations, their causes need to be ascertained for necessary actions so as to minimize failures.

THEORETICAL FRAMEWORK

Downtimes of GSM facilities are the time which the GSM facilities are not working or unavailable to be used by subscribers. According to Ubani (2007), the operations of transformation processes in the industrial sector of the economy are characterized by incessant downtimes and inefficient utilization of time, and these result to poor performance of the sector. Similar downtimes problem are being suffered by the GSM operations in Nigeria when one considers the high frequency and syndrome of network busy, network failure, no network, service difficulties etc. Telsang (2005) favours the use of failure statistics and failure analysis approaches to downtimes analysis. Failure statistics have the following benefits:

i. Depending upon the time of failure, one can immediately identify whether the cause of failure is due to design defect, or a wear out failure or any other reason and helps to take maintenance decision whether to repair or replace.
ii. Provides valuable information regarding the life and reliability of the equipment to the design engineer.
iii. Failure statistics helps to take maintenance policy decisions as to whether to opt for repair or preventive or replacement options.
iv. It is important information for spare parts management.

However, the information on failure data is to be collected over a large population and also for extensive period of time. If the equipment is unique, then the failure statistics is limited because by the time data is collected for meaningful analysis, the life of the equipment would have been over. This difficulty can be overcome, if the data on similar equipments elsewhere is available. The failure analysis is represented in the figure 1 below. The wear out failure is due to: failures based on inherent quality and reliability characteristics in design and manufacturing, manufacturing defects, poorly installed equipment or machinery. The chance failures will occur due to operation induced failures, damage of equipments due to improper handling, accidents etc.

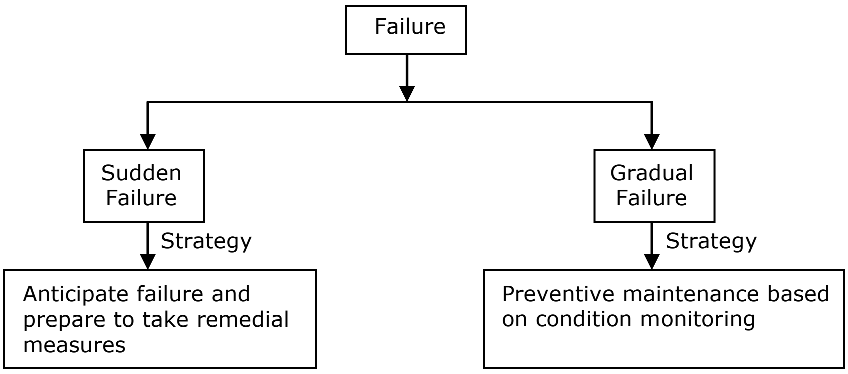

Fig. 1; Failure analysis: (Source; Telsang 2010)

Organizations therefore need to discriminate between failures and pay attention to those which are critical either in their own right or because they may jeopardize the rest of the operation. According to Slack et al (2004), failure in an operation can occur for different reasons, which can be grouped as follows: those which have their source inside the operation, because its overall design was faulty or because its facilities (machines, equipment and buildings) or staff fails, those which are caused by faults in the materials or information inputs to the operation, those which are caused by the actions of customers. Therefore all facilities (that is, the machines, equipment, buildings and fittings) of an operation are liable to facilities failure or breakdown. The breakdown may be partial or a total and sudden cessation of operation (Slack et al 2004). Either way, it is the effects of breakdown which are often unpleasant that are important. For instance, some failures in GSM facilities can bring a large part of the operation to a halt while other failures might only have a significant impact if more than one of its type occur simultaneously. Slack et al (2004) further posits that there are three main ways of measuring failure as follows: failure rates- how often a failure occur, reliability- the chances of a failure occurring, availability- the amount of available useful operating time. Failure rates and reliability are different ways of measuring the same thing- the propensity of an operation or part of an operation, to fail. Availability is one measure of the consequences of failure in the operation. Failure rate is therefore calculated as the number of failures over a period of time. Failure rate (FR) can be measured either as a percentage of the total number of products tested or as the number of failures over time.

$$FR = \frac{Number\ of\ \ failure}{Total\ number\ of\ \ products\ tested} \text{ x } 100 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. 1$$

$$Or;\quad FR = \frac{Number\ of\ \ failure}{Operating\ time} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. \quad 2$$

Failure, for most parts of an operation is a function of time. For instance downtimes or failure of GSM operating facilities is adjudged by the length of time the GSM service delivery is either completely out (no network) or partial service delivery. It is a fact that at different stages during the life of any equipment, the probability of it failing will be different; usually highest at old age.

STRUCTURE OF CELL SITE-EQUIPMENT FOR GSM FACILITIES

Blake (2002) examines cell site equipment, an integral part of GSM facility and states that the radio transmitting equipment at the cell site operates at a considerable higher power than do mobile phones, but this power is shared among all the channels that are used at the site. Similarly, there must be receiver for each voice and control channel is used at the site as well as extra receivers for monitoring the signal strength of mobiles phones in adjacent cells. Consequently, the cell site equipment is much more complex, bulky and expensive than the individual cell phones. In addition, cell sites often need directional antennas to facilities the division of each cell into sectors. The sites radio equipment is operated by a Base State Controller (BSC). The BSC takes care of an air interface (ie the combination of mobile cellular phone and cell-site radio equipment is called the air interface): assigning channel and power levels, transmitting signaling tones etc. The mobile switch centre (MSC) routes calls along a private copper, fibre optic, or microwave network operated by the cellular service providers. Their action is also required in authorizing calls, building, initiating handoffs etc. Sometimes, BSC and MSC are combined. Associated with MSC are data banks where locations of local and roaming mobiles are stored. The complexity of cell site equipment made it to require adequate care in the supply contract.

METHODOLOGY

The study adopted opinion survey of research design with area and judgmental sampling techniques. The geographical areas covered by the study are the South-South and South-East Nigeria because of massive economic activities such as construction of on-shore and off-shore oil and gas production facilities, roads and building construction project, high population density etc. and high concentration of operating GSM facilities. Free flow of timely information is necessary to achieve the project success objectives: vis-à-vis, scheduled completion within budget and quality specification. The primary sources of data on the contributory factors to downtimes was obtained from the following GSM companies in the geographical area; Zain, MTN and Globacom. The instrument used for data collection and measurement is questionnaire modeled in likert five point scale.

Table 1: Questionnaire allocation and returns from target respondents.

Focused GSM Company	Number of copies allocated	Number of copies returned	Percentage of total returned
Zain	25	21	28.00
MTN	25	23	30.67
Globacom	25	20	26.57
Total	75	64	85.34

Table 2: Responses by professionals and technical skilled workers

Target respondents	Number of questionnaire returned
Electronic and communication engineers	28
Civil and construction engineers	14
Mechanical engineers	10
Project and maintenance managers	12
Total	64

Table 3: Responses by geographical zone

Geographical zone	Number of questionnaire returned
South-East	28
South-South	36
Total	64

The hypothetical factors and their constructs responsible for breakdown or failure related downtimes of operating GSM facilities that affect PMIS are called independent variables in the model formulation. They are presented as follow:

X_1: Power supply outage: public power supply, electric power generators, alternative power supply, fuel scarcity and shortage in supply, poor maintenance of private power generating sets, erratic power supply and low current, back-up or redundancy system.

X_2: Base Transceiver Station (BTS): Accessibility and location constraints, constructability, structural strength, environmental impact assessment, land ownership tussle, right of way.

X_3: Site transmission equipment: microwave radio system, optic fibre cable, satellite transmitters, multiplexers, digital cross connect, software upgrade facilities, BSC, MSC etc.

X_4: People failure: incompetent technical manpower, principles of safe failing: conscious and conscious error, unsafe and unsatisfactory work environment, lack of motivation and incentives to workers, poor condition of service, errors and violation of set procedures in GSM operational facilities.

X_5: Force majaure and disaster: flood, lighting, extremely temperature, corporate crime, theft, fraud, unrest, youth restiveness and militancy etc.

Y: Dependent variable, representing level of downtime of operating GSM facilities.

In order to estimate the level of downtime of GSM facilities when these contributing factors are taken into consideration, a multivariate computer-based analytical tool of multiple regression analysis was used for the study. The analysis was carried out with computer software; Statistical Programme for Social Science (SPSS) version 15, conducted at 5% level of significance. Multiple regression analysis is an associative technique which relies on the identification of related variables that can be used to predict values of interest (Stevenson 2007). The study adopted a multiple regression model so as to predict the level of downtime of operating GSM facilities due to individual and collective contributory factors; X_1, to X_5, Nworuh (2003) asserts that in economics and business, the nature of the problems encountered in real life is often expressed in more than two variables. Multiple regressions approximates these real life problems where it measures the relationship existing between two or more variables, hence the selection of the model is justified. The decision rule in the determination of the magnitude of collective and individual contribution of the independent variables is by power of test (p-value) and level of significance $\alpha = 0.05$. If p-value $< \alpha$, the test is significant for that particular independent variable factor, otherwise, not significant and vice versa.

The multiple regression model specifications are as follows:

$y = a_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5$ ……………………………………………..… 2

where a_0, b_1, b_2 ….. b_5 represent the parameters to be estimated. Other regression parameters that were determined are the correlation coefficient R and coefficient of determination R^2. These measured the strength of the relationship between independent variables and y and the extent to which they are accounted for by the relationship equation respectively.

The correlation matrix existing among the variables is presented and analyzed in table 3 with the aid of SPSS computer software;

The distribution of the correlation coefficient shows that the highest value of 0.758 is for power supply outage x_1 and site transmission equipment failure x_3. Also the lowest value of 0.014 is for people failure x_4 and BTS failure x_2. There is no problem of colinearity and therefore the variables are therefore worthy of introduction into the regression analysis model adopted for the study.

Table 4: Model Summary

Model	R	R square	Adjusted R Square	St. Error of the Estimate	Durbin-Waston
1	.916[a]	.839	.825	1.122	2.392

a. Predictors: (Constant), Force majeure, Base Transceiver Station (BTS) component Failure, People Failure, Site Transmission equipment Failure, Power supply outage.
b. Dependent Variable: Level of downtime of GSM Facilities.

Source: Computer Analysis Result.

Table 1 is the model summary which shows that the correlation coefficient R = 0.916 (91.6%) and coefficient of determination R^2 = 0.839 (83.9%). These show that the strength of relationship existing between; power supply outage, BTS component failure, site transmission equipment failure, people failure, force majeure and downtimes of operating GSM facilities is very high. Also, the percentage or proportion of variables accounted for by the relationship equation is 83.9%.

Table 5: Descriptive Statistics.

	Mean	Std. Deviation	N
Level of downtime of GSM Facilities	40.55	2.684	64
Power supply outage	17.61	2.549	64
Base Transceiver Station (BTS)	17.06	1.542	64
Site transmission equipment failure	17.84	2.064	64
People failure & disaster	20.38	2.491	64
Force majeure	18.95	1.516	64

Source: Computer Analysis Print-out.

Table 6: Correlations Matrix

		Level of downtimes of GSM Facilities	Power Outage	Base Transceiver Station (BTS) Failure	Transmission Failure	People Failure	Force Majeure
Pearson Correlation:	Level of downtime of GSM Facilities	1.000	.839	.368	.809	.624	.669
	Power supply outage	.839	1.000	.188	.758	.578	.685
	Base Transceiver Station (BTS) Failure	.368	.188	1.000	.103	.014	.327
	Site transmission equipment	.809	.758	.103	1.000	.641	.545
	People Failure	.624	.578	.014	.641	1.000	.471
	Force Majeure	.669	.685	.327	.545	.471	1.000
Sig. (1-tailed):	Level of downtime of GSM Facilities		.000	.001	.000	.000	.000
	Power outage	.000		0.68	.000	.000	.000
	Base Transceiver Station (BTS) Failure	.001	.058		.209	.455	.004
	Site transmission equipment	.000	.000	.209		.000	.000
	People Failure	.000	.000	.45	.000		.000
	Force majeure & Disaster	.000	.000	.004	.000	.000	

Source: Computer Analysis Print-out

Table 7: coefficients for students t-test

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1.	(Constant)	12.981	2.253		5.761	.000
	Power supply outage (x_1)	.430	.099	.408	4.364	.000
	Base Transceiver Station (BTS) failure (x_2)	.406	.098	.233	4.121	.000
	Site transmission failure (x_3)	.477	.114	.367	4.200	.000
	People failure (x_4)	.133	.077	.123	1.735	.088
	Force majeure & disaster (x_5)	.096	.135	.055	.724	.472

Source: Computer Analysis using SPSS

The regression or predictive model of the relationship is deduced from table 4 above as follows:

$Y = 12.981 + 0.430x_1 + 0.406x_2 + 0.477x_3 + 0.133x_4 + –0.096x_5$ ………. 3

The predictive model shown in equation 3 can be used to predict the aggregate downtimes of operating GSM facilities when the independent variables are taken into consideration.

The result of the research and renaissance survey was based on the identified five major contributory factors to downtimes of operating GSM facilities whose roles on project communications and PMIS were subsequently examined and analysed with multiple regression model. Table 5 indicates that x_1, x_2, and x_3 are the most significant contributory factors to downtimes of operating GSM facilities. Concerted efforts should be directed to the mitigation of adverse effects of these factors so as to enhance the performance of GSM facilities for free, seamless and unimpeded flow of information needed for PMIS and project success. Decisive remedial action should be taken against the unit component failures and breakdown of subsystem.

Table 8: Significant Ranking of contributing factors of downtimes in operating GSM facilities as they affect PMIS: (level of significance = (0.05).

Factor	t-value	p-value	Rank	Remark
x_1 = Power supply outage	4.36	0.000	1st	Significant
X_2 = Site transmission equipment	4.200	0.000	2nd	Significant
X_3 = BTS component failure	4.121	0.000	3rd	Significant
X_4 = People failure	1.735	0.088	4th	Not significant
X_5 = Force majaure	0.055	0.472	5th	Not significant

DISCUSSION OF THE RESULTS

Power supply outage (x_1) ranks the highest as the most significant contributor to downtimes of operating GSM facilities. Power supply outage unequivocally contributes to the longest downtimes, poor service delivery and non reliability of operating GSM services in Nigeria. Adenikinju (2005) affirms that as a result of power outages, firms lost an average of 792 working hours in 1998, assuming a nine hour working day. This translates to about 88 working days in 1998. Also, about 35% of the firms reported have to shut down production at one time or the other in the year as a result of power outages. It could be that auto-generators for power and their spare parts are of low quality, expensive and lack the required durability and competent engineers, and effective maintenance policy. Site transmission equipment failure (x_3) ranks second as major contributory factor to downtimes of GSM facilities. The failures of transmission equipments are also due to component failures. The site transmission equipments include optic fibre, microwave radio systems, satellite transmitters, multiplexors, digital cross connect etc. Components of the various site transmission equipments fail because they are either defective, vandalized, difficult to detect, cannot withstand their respective applications due to tropical harsh weather condition or when they are subjected to aggressive operating environment.

Base Transceiver Station (BTS) failure (x_2) is also a significant contributory factor to downtimes of GSM facilities as it is third in significant ranking. The unit components of BTS such as radios and BTS processors are characterized by incessant failure and they cannot match the performance that customers expect from the services. People failure (x_4) is what Slack et al (2004) describe and categorize into two types as errors and violations. Errors are mistakes in judgment with hindsight; that a person should have done something different. Violations are acts which are clearly contrary to defined operating procedures. The contributions of people failure to downtimes of operating GSM facilities are not significant. This could be due to the fact that skilled and unskilled manpower or labour forces abound in Nigeria coupled with high unemployment's rate. As a result of that, majority of those who are fortunate to be employed usually remains committed, diligent, proactive and quality consciousness as nobody wants to lose his or her job. Force Majeure (x_5); ranks 5th and last as a contributory factor to downtimes of operating GSM facilities and it is not significant in ranking. Force majeure are unexpected circumstances such as disasters that can be used as excuse when they prevent somebody from doing something. Such disasters such as flood, lightning, extreme temperatures, corporate crime, thefts, fraud, civil unrest, etc. are not common in Nigeria. Also, the Niger Delta militants in Nigeria have not been reported to have attacked the GSM installation and facilities. However, the GSM facilities belonging to MTN Nigeria were destroyed by wind and rain storms around Owerri in South East Nigeria towards the end of July 2009, and that adversely affected the coverage and quality of service delivery of that GSM service provider. The year 2012 witnessed unprecedented flood that devastated and destroyed, many GSM facilities in some parts of Nigeria especially in the South East states. Also in the same year, suspected religion sect; Boko Haram attacked GSM facility installation in the Northern part of Nigeria.

The operation of GSM facilities are to provide and deliver services to met the customer's expectation. These are not always realized due to components failure and downtimes of facilities due to myriad of factors. The study therefore recommends predictive maintenance policy using both human and machine sensors for failure prediction, detection and analysis. Also, acquisition and procurement of multiple redundancy or back-up system for each component or subsystem is advocated. Capacity building and introduction of principles of fail-safeing will help to minimize or prevent human errors in the operations of GSM facilities. Slack, et al, (2004) assert that the concept of fail-safeing minimizes or prevents human errors in operations. The idea is based on the principle that human mistakes are to some extent inevitable. What is important is to prevent them from causing defects. They are preferably inexpensive devices or systems which are incorporated into a process to prevent inadvertent operator's mistakes resulting to defects. The identification of significant contributory factors to downtimes of operating GSM facilities and putting in place appropriate contingency plan and remedial measures will enhance free flow of communication and PMIS as well as facilitating project success.

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