



# COMPARATIVES ASSESSMENT OF RELIABILITY OF ZINOX LAPTOP COMPUTERS IN DIFFERENT RANGE OF YEARS

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## ABSTRACT

Information Technology plays a vital role in the development of the economy of any nation as its impacts is brought to bear on the many facets of the economy. On the average, about 75% of hardware and software facilities available in Nigeria are in optimum use and this has increased the efficiency in service and product delivery by some 78.8% [Chidi E. Akujor/ Advances in Science and Technology, Vol. 4, No. 2,].Based on the data used for this project, the reliability, which is the probability of Zinox laptop computers to perform its required function under stated conditions for a stated period of time, was found to be 0.9998. This shows that the products are very reliable. the mean time between failures was found to be 12.44 years; which shows that, the system would survive for a period of 12.44 years before it fail. And the reliability of Zinox laptop computers was found to be 0.9998; which shows that they are very reliable product.

## I. INTRODUCTION

Presently, computers are very sophisticated machines and their applications increase very rapidly. Moreover, according to some predictions, the present world automobile business will sooner or later be overtaken by the computer business. This implies that computer business will be the largest single determining factor of the world economy [3] Computers are used in critical areas such as aerospace, nuclear power generation and defense. Other area of computer application include: banking industry, communication and personal use by individuals. For these ever-increasing applications, reliability of computer is very much essential and important. Other factors such as increasing cost of repair and maintenance also necessitate the need for reliable computer systems. Some computer hardware manufacturers such as IBM, AMDAHL and UNIVAC make use of redundancy techniques in order to improve the hardware reliability of computer systems. However, in computer system, the reliability problem is not restricted to the hardware component but it also involves the software components. Thus, both the hardware and software component of a computer system have to be reliable for the successful operation of the system. Therefore, there is a great need to place a great emphasis on the reliability of both the hardware and the software components of a computer system. Since early 1970's, interest in the reliability of systems has been increasing rapidly due to the failure of complex system. Thus, designing and manufacturing of computer systems (and other systems) reliably, is very significant due to some reasons among which are: complexity of equipment system, cost of operation and maintenance as wells perceived risk. Firstly, a



similar project titled “Reliability Analysis of Zinox Desktop Brand Computer” was carried out in December 2007. He was able to find the reliability of Zinox Desktop Computers [3]. Therefore my project is an advancement over his project because it is aimed at analyzing the reliability of more recent Zinox products (i.e. Zinox Laptop computers) instead of an old modern Zinox product (i.e. Zinox Desktop computers) as it was the case in his projects.

Secondly, a similar project titled “Analysis on the reliability of Hp laptop computers” was carried out in March 2007[9]. The main shortcoming of this project was that he obtained his data from a small computer training centre whose available computers were less than fifty by then thus, this project can be regarded as an improvement over this project because the data for the project was obtained from a relatively larger computer training institute whose available computers range from fifty thousand to two hundred and fifty thousand.

Thirdly, similar project titled “Zinox Desktop Computer Reliability Analysis” was recently carried out in March, 2009[10]. Among the shortcomings of this project is the period of less than a year, based on which he assessed the reliability of Zinox desktop computers. The advancement of this project over this is that, data for a period of eight years would be considered to assess the reliability of Zinox laptop computers.

## II. MATERIAL AND METHODOLOGY

Literature review on reliability/reliability analysis and past projects related to reliability analysis would be revised in order to know the basic concept on reliability analysis. Data would be collected from BZ computer training institute, Adetakumbo Ademola Crescent, Wuse II, Garki-Abuja. This would be achieved by sending a letter to this organization in order to get a comprehensive data from them. The scope of this project work is focused on the reliability analysis of Zinox laptop computers in some northern part of Nigeria (particularly Abuja) in order to investigate the causes of failures. This would be achieved by determining the reliability of Zinox laptop computers in accordance to standard. The limitations of this project are, the area coverage considered may be too small and the data used for the study may be too small for an accurate reliability assessment of Zinox laptop computers. In this project, the reliability of Zinox laptop computers would be calculated using a total period of one year (as it would be shown in detail later). However, the data obtained is for a period of eight years (as it was shown during data presentation). Thus, for the data to be used as a one-year period data, the number of individual used components and the number of individual failed components was calculated, using the data presented in the tables below.

## III. ANALYSIS OF THE RESULT AND DISCUSSION

The data for this study was obtained from the maintenance section of BZ computer training institute, Adetakumbo Ademola Crescent, Wuse II, Garki-Abuja. The data was extracted from the institute's documentation Zinox Laptop Computers for eight years (from 2004 to 2012). The data was collected at an average temperature of 32(<sup>0</sup>C) and relative humidity of 24(%). The details of the documentation are contained in the Table 1 to 8 shown below:



**Table 1: Computer Components from 2004 To 2005**

YEAR	NO. OF AVAILABLE COMPUTERS	COMPONENT TYPE	NO. OF COMPONENT USED	NO. OF FAILED COMPONENTS
2004-2005	50,000	Power Switch	56,000	10965
2004-2005	50,000	CD-ROM	50,700	9455
2004-2005	50,000	Mother Board	56,000	12450
2004-2005	50,000	Cooling Fan	50,050	11075
2004-2005	50,000	Keyboard	50,800	10531
2004-2005	50,000	Mouse	55,040	10540
2004-2005	50,000	Power Supply Unit	50,550	9560

**Table 2: Computer Components from 2005 to 2006**

YEAR	NO. OF AVAILABLE COMPUTERS	COMPONENT TYPE	NO. OF COMPONENT USED	NO. OF FAILED COMPONENTS
2005-2006	60,000	Power Switch	66,070	9962
2005-2006	60,000	CD-ROM	60,050	10561
2005-2006	60,000	Mother Board	64,040	15562
2005-2006	60,000	Cooling Fan	60,060	10454
2005-2006	60,000	Keyboard	63,040	11462
2005-2006	60,000	Mouse	65,030	10462
2005-2006	60,000	Power Supply Unit	65,330	10965

**Table 3: Computer Components from 2006 to 2007**

YEAR	NO. OF AVAILABLE COMPUTERS	COMPONENT TYPE	NO. OF COMPONENT USED	NO. OF FAILED COMPONENTS
2006-2007	75,000	Power Switch	76,060	11420
2006-2007	75,000	CD-ROM	70,080	11640
2006-2007	75,000	Mother Board	64,090	17446
2006-2007	75,000	Cooling Fan	70,060	14235
2006-2007	75,000	Keyboard	73,080	13456
2006-2007	75,000	Mouse	75,030	12452
2006-2007	75,000	Power Supply Unit	75,370	8900

**Table 4: Computer Components from 2007 to 2008**

YEAR	NO. OF AVAILABLE COMPUTERS	COMPONENT TYPE	NO. OF COMPONENT USED	NO. OF FAILED COMPONENTS
2007-2008	125,000	Power Switch	127,070	11740
2007-2008	125,000	CD-ROM	126,050	11605
2007-2008	125,000	Mother Board	125,040	16960
2007-2008	125,000	Cooling Fan	125,060	15750
2007-2008	125,000	Keyboard	130,040	14764
2007-2008	125,000	Mouse	132,030	13740
2007-2008	125,000	Power Supply Unit	129,330	10643

**Table 5: Computer Components from 2008 to 2009**

YEAR	NO. OF AVAILABLE COMPUTERS	COMPONENT TYPE	NO. OF COMPONENT USED	NO. OF FAILED COMPONENTS
2008-2009	200,000	Power Switch	207,070	10012
2008-2009	200,000	CD-ROM	206,050	11450
2008-2009	200,000	Mother Board	215,040	18745
2008-2009	200,000	Cooling Fan	200,060	14240
2008-2009	200,000	Keyboard	210,040	15450
2008-2009	200,000	Mouse	200,030	14633
2008-2009	200,000	Power Supply Unit	202,330	9425

YEAR	NO. OF AVAILABLE COMPUTERS	COMPONENT TYPE	NO. OF COMPONENT USED	NO. OF FAILED COMPONENTS
2009-2010	210,000	Power Switch	220,070	11724
2009-2010	210,000	CD-ROM	206,050	12720
2009-2010	210,000	Mother Board	214,040	119762
2009-2010	210,000	Cooling Fan	209,060	15764
2009-2010	210,000	Keyboard	210,040	15700

2009-2010	210,000	Mouse	211,030	15722
2009-2010	210,000	Power Supply Unit	222,330	10022

**Table 6: Computer Components from 2009 to 2010**

**Table 7: Computer Components from 2010 to 2011**

YEAR	NO. OF AVAILABLE COMPUTERS	COMPONENT TYPE	NO. OF COMPONENT USED	NO. OF FAILED COMPONENTS
2010-2011	210,000	Power Switch	207,070	10492
2010-2011	210,000	CD-ROM	206,050	12775
2010-2011	210,000	Mother Board	215,040	21415
2010-2011	210,000	Cooling Fan	200,060	15255
2010-2011	210,000	Keyboard	210,040	21965
2010-2011	210,000	Mouse	200,030	14297
2010-2011	210,000	Power Supply Unit	202,330	8920

**Table 8: Computer Components from 2011 to 2012**

YEAR	NO. OF AVAILABLE COMPUTERS	COMPONENT TYPE	NO. OF COMPONENT USED	NO. OF FAILED COMPONENTS
2011-2012	250,000	Power Switch	267,070	8945
2011-2012	250,000	CD-ROM	266,055	10652
2011-2012	250,000	Mother Board	245,047	22225
2011-2012	250,000	Cooling Fan	203,068	16453
2011-2012	250,000	Keyboard	290,040	22995
2011-2012	250,000	Mouse	240,037	15002
2011-2012	250,000	Power Supply Unit	272,339	7225



From the data used in chapter three, it is obvious that motherboard failure constitutes most of the failure of Zinox laptop computers. Some of the causes of the failure of the motherboard of Zinox laptop computers include: misuse failure due to improper removal of the mouse code and keyboard code from board and the failure of the cooling fan which renders it unable to radiate out the heat generated by the processor. The second most failure-dominant components are the cooling fan and keyboard. The failure of these two components is often as the result of their misuse.

CD-ROM failure is often due to dust which hinders the LED from lighting on the disk. Similarly, power switch failure is also to dust which causes the switch to hook while switching OFF and ON.

In addition, on the basis of the explanation of the basic faults above, we can make the following deductions.

- i. High environmental operating temperature causes stress to the components. Many of the components need air-conditioning because their designed operating temperatures are lower than the temperature range in this region. The high environmental operating temperature can cause the melting of some components and the burning of others such as transistors and ICs.
- ii. Improper handling of components by users also contributes to most mechanical faults. And this occurs when the users are either not adequately trained or they totally lack the technical know-how of the components.
- iii. Dust is also a significant factor in causing mechanical faults. For instance, dust affects keyboard by making the keys unable to have a good contact when pressed but this can easily be prevented by using a blower.
- iv. Mechanical failure of Zinox laptop computers can also be as a result of too much pressure on the equipment, which is often due to overuse or sometimes due to improper frequent use.

#### IV. CONCLUSION AND RECOMMENDATIONS

Based on the data used for this project, the reliability, which is the probability of Zinox laptop computers to perform its required function under stated conditions for a stated period of time was found to be 0.9998. This shows that the products are very reliable.

Moreover, broadly speaking, some environmental factors such as high operating temperature as well as the manufacturers and the users of any product (Zinox laptop computers inclusive) affect the reliability of the product. Thus, both the manufacturers and the users of any equipment (Zinox laptop computers inclusive) are responsible for ensuring the reliability of the device. Thus, the manufacturers of Zinox laptop computers (as well as those of the other products) should do their best to ensure that their products survive at least to the warranty or stated period of time. This is because frequent failure of their products could damage their reputation and this negatively affects their future business prospect. Secondly, within the warranty period, manufacturers of products often suffer a high cost for the failure of their products. However, manufacturers alone cannot attain total reliability because some environmental and human factors also affect the reliability. However, precautions such as good packaging help immensely in reducing the risk of failure of products. Moreover, since outside the warranty period, it is the customers of products that suffer any cost for the failure of the products, then users should take all possible precautions when using their computers. The manuals provided



to users by manufacturers could help the users to use their computers properly. Thus, these manuals should be studied carefully by the users so as to avoid as many misuse errors as possible.

Finally, the manufacturers of Zinox laptop computers, having realized the negative effects of producing low reliable products, should do their best to minimize the damages that might result from the users' faults. In this presentation and analysis, eight-year period data on zinox laptop computers' failed items was presented and analyzed. Based on the data, the mean time between failures was found to be 12.44 years; which shows that, the system would survive for a period of 12.44 years before it fail. And the reliability of zinox laptop computers was found to be 0.9998; which shows that they are very reliable products.

#### 4.1 Recommendations

This project is just a little effort made in an attempt to analyze the reliability of zinox laptop computers so as to assist both the manufacturers and the users of this product in this region in ensuring more reliable zinox laptop computers. Based on the observations made during the study, the following recommendations are made:

#### 4.2 Recommendations for Manufacturers

1. Mother board is the most failure-dominant component of the zinox laptop computers used in northern Nigeria (particularly Abuja). The failure of this component is mainly due to high temperature in the region about 32(<sup>0</sup>C) and relative humidity of 81(%). Therefore, it is recommended that, for the zinox laptop computers intended to be used in this region, a good cooling system should be incorporated in to the mother board.
2. The manufacturers of zinox laptop computers should provide more friendly hardware so as to reduce the frequency of hardware faults caused by the users.
3. The manufacturers of zinox laptop computers should employ more improved protective devices and techniques such as effective casing so as to prevent equipment from environmental effects such as temperature and relative humidity.

#### 4.3 Recommendations for Users

1. The users of zinox laptop computers should ensure a proper handling of the systems so as to prevent mechanically related faults.
2. The users of laptop computers should abide by the operational conditions provided by the manufacturers in the operator's manual.

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