

Diagnostic Techniques Skills Need by System Administrators for Computer Maintenance in Federal Universities in South-South, Nigeria

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Abstract

This study sought to investigate the diagnosis technique skills possessed by system administrators for computer maintenance in Federal Universities in South- south, Nigeria. three specifics objectives, three research questions and three research hypothesis were formulated to guide the study. Descriptive research design was adopted for the study. The population of the study comprised 370 respondents made up of 277 maintenance administrators and 93 experts (lecturers) drawn from the eight federal University in south-south Nigeria. The sample size of this study was 186 respondents made up of 138 maintenance administrators and 48 experts (lecturers) also drawn from the eight federal Universities in south -south Nigeria, through Taro Yamane formula. Simple random technique was adopted for the study. The instrument captioned “Diagnosis techniques skills possessed for computer maintenance by system administrators Questionnaire” (DTSPFCMSAQ was used for data collection. The instrument was face validated by three (3) experts in the Department of Computer and Robotic Education University of Uyo. Cronbach Alpha was used in determining the reliability coefficient of the instrument where the coefficient of 0.71 was obtained indicating that the instrument was reliable. Mean statistics was used in answering the research questions while the independent t-test was used in testing the null hypotheses at 0.05 level of significance using Statistical Package for Social Science (SPSS) The findings of this study revealed that there is moderate and significant difference in the mean response between system administrators and expert(lecturers) on antivirus scanning skills, malware scanning skills and rootkit detection skills for computer maintenance in Federal Universities in south -south Nigeria. It was concluded that diagnostic techniques skills possessed moderate and significant difference for the maintenance of computer in Federal Universities in south -south Nigeria.

Keyword: Diagnostic Techniques Skills, System Administrators, Computer Maintenance

Introduction

In the contemporary digital landscape, the role of system administrators has become increasingly pivotal, especially in academic institutions. The primary responsibility of these professionals is to ensure the seamless operation and security of computer system which involves a variety of diagnostic techniques. (Williams, 2020) opined that the effective utilization of diagnostic techniques skills in computer maintenance helps to identify and resolve potential issues before it escalated into significant problems. Modern computer issues require a critical skill set by the system administrators to identified and determined the causes of problem for optimal system reliability performance which includes: antivirus software scanning skill, malware scanning skills and rootkit detection skills.

Antivirus scanning skill entails the ability to utilize the antivirus programs to track down Trojans, spyware and other software circulated by cybercriminal to prevent and remove anomalies in a computer system. According to Hsu (2020), antivirus software forms the foundation of computer security for system administrators. It is a critical skillset aspect for maintaining the security efficiency and overall functionality of IT infrastructures. This skill helps prevent and mitigate the risks associated with malware and other security threats, ensuring the continuous operation of academic and research activities in an institution.

Antivirus software was originally developed to detect and remove computer viruses. However, with the proliferation of other kinds of malware, antivirus software started to provide protection from other computer threats through effective scanning skills. Modern antivirus software can protect malicious browser hijackers, ransomware, key loggers and Trojan horses.

According to Cheng *et al.*, (2016) malware scanning skill is critical skill set for system maintenance administrators. Regular malware scanning are vital for detecting malicious software that may compromise system performance and data security. Administrators must be proficient in using various malware scanning tools to identify and remove viruses, worms, ransomware and other types of malicious software. Ferra and Ferrara (2018) This helps in detecting malware activities across the entire network, reducing the chances of a successful attack.

A rootkit detection skill is a method designed to detect a malicious software against gaining administrative-level control over a computer system without being detected. Hu, *et al.* (2017). explained that rootkits are difficult to remove, in some cases required a complete re-installation of the operating system. Rootkit detection is presently more advanced aspect of system maintenance. (Gao *et al.*, 2020). System administrators must recognize the signs of rootkit infections and used detection tools to uncover and eliminate these threats. Effective rootkit detection is crucial for protecting sensitive data and ensuring that PCs remain secure from sophisticated attacks.

Michael (2015) Some product also include protection from other computer threats, such as infected and malicious Uniform Resource Locator (URL), spam, scam and phishing attacks,

online banking attacks, social engineering techniques, advanced persistent threat (APT) and distributed denial-of-service (DDoS) attacks.

System Maintenance Architecture

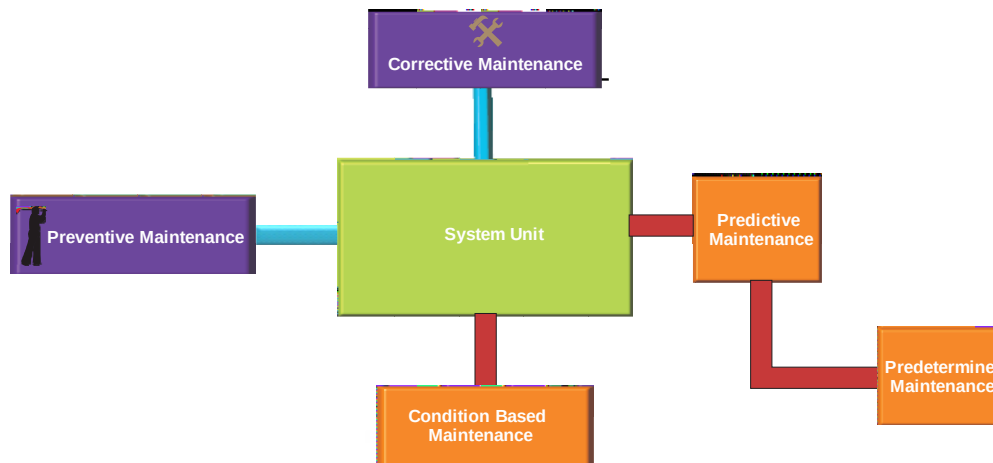


Figure 1: System Maintenance Architecture

Source: Ani (2024)

Roberts (2015) highlighted the following types of computer maintenance as essentiality for system administrators: preventive maintenance, conditioned based maintenance predictive maintenance and corrective maintenance, predetermined maintenance

Moore and Benbasat (2019) opined that preventive maintenance aimed at detecting and fixing problems before it happens. It is commonly carried out in the form of regular inspections. Tan (2018) maintained that when inspecting machine or equipment, System administrators are expected to carefully checked for all signs for imminent breakdown and replace the intended damaged parts immediately. This will prevent crisis during operations in an industries and institutions and ensure organizational needs and growths for a continuous productivity.

Condition-based maintenance is sometimes considered to be a more advanced alternative to preventive maintenance. Rather than being inspected according to a schedule guides, machines are carefully observed for changes that could indicate upcoming failure. (Moore and Benbasat 2019) maintained that condition-based maintenance enhances system administrators to observed the system running and identify variables that could affect functioning, like temperature, vibration speed, power, the presence or absence of moisture and provides needed solution against recurring.

Addae (2016) opined that predictive maintenance refers to a specific type of condition-based maintenance in which constant observation via sensor devices are made. These devices are attached to components of the system and feed constantly, indicating real-time data to software.

Wang and Stavrou, (2016). the software then interprets this data and warns maintenance technicians or the system administrators of approaching danger. Predictive maintenance is generally considered to be the most advanced and intensive type of maintenance.

Anderson and Smith (2012) postulated that Corrective maintenance is initiated when a problem is discovered while working on another system. For example, during a scheduled maintenance check or while fixing another issue, a maintenance technician or system administrators notices that a hard disk or system memory is not working as it should. Corrective maintenance is then scheduled for a future date where the problem is repaired or replaced, it reduces emergency repairs and increases employee safety.

Predetermined maintenance is carried out using rules and suggestions created by the original manufacturers rather than the maintenance team. these suggestions are based on experiments and gathered data. Addae (2016) The manufacturer provides statistics and guidelines usually when the equipment is first purchased and will include data providing the average lifespan of both the entire system and its various parts

As Nigerian tertiary institutions increasingly integrate digital technologies into their operations, effective monitoring of malware threats for proper computer maintenance have become crucial. These aspects ensure not only the security of sensitive academic data but also the smooth functioning of IT infrastructure. Understanding and implementing robust malware monitoring practices for computer maintenance are essential for institutional cybersecurity effectiveness (Ojo and Nwachukwu, 2020).

Rootkits are malicious software tools designed to gain unauthorized access to a computer system and hide its presence while allowing hackers to gain privileged access and control users devices such as hard drive, router or system Bios. However, system administrators must be knowledgeable about various rootkit detection skills and tools such as Rootkit Hunter and GMER to eliminate cybercriminal intention against disruption of academic operations (Gao *et al.*, 2020). (Chen and Xu, 2021).

Bennett and Smith. (2023) examined antivirus software skills utilization training and the diagnostic workflow for decision-making processes of IT technicians in Nigeria. The objective of the Study was to evaluate the influence of antivirus skills utilization training on the diagnostic workflow and decision-making processes of IT technicians. The research design adopted was experimental study and the population was IT technicians in a large software development firm with a sample size of 90 technicians. The method of data collection was pre- and post-training diagnostic assessments and workflow analysis. Data was analyzed using workflow efficiency analysis and paired t-test for performance change. Findings indicated that scanning training resulted in faster malware detection and remediation, but did not significantly improve diagnostic decision-making in other technical areas. Diagnostic. Therefore, It was recommended that IT training should include both malware-specific skills and general diagnostic decision-making techniques to optimize workflow. This study is correlated with the present research study as the both researchers (old and the new authors) evaluated malware scanning for diagnostic techniques

Johnson and Johnson (2020) investigating the impact of malware scanner expertise on IT technicians' diagnostic efficiency, the objective of the Study was to assess how proficiency the use of malware scanning affects computer problem-solving by IT technicians. The research design adopted was experimental design with the population comprised IT technicians working in corporate IT departments in south Korea. the sample size was 150 technicians and data was collected using pre- and post-test on diagnostic tasks. The result of the findings indicates that technicians with advanced malware scanning skills significantly improved their ability to identify and resolve malware-related issues quickly. It was recommended that regular training programs on integrating malware scanning tools be organize for IT technicians. The present study aligns with the previous study in term of objective used in the study and difference in term of method of data collection and method of data analyses. However, both researchers emphasizing on the importance of malware scanning skills as a foundational element for efficient computer maintenance.

Patel and Iyer (2021) examined rootkit detection and its impact on troubleshooting of computer by system maintenance administrators. The objective was to examine the role of rootkit detection skills in improving the technical troubleshooting capabilities. The research design adopted was mixed-methods design (qualitative and quantitative), the population comprised system administrators working in enterprise environments in India with the Sample Size of 150 system administrators (75 with rootkit detection skills, 75 without). Method of data collection was surveys, technical skills assessments and rootkit detection tasks. data was analyzed using statistical comparison of diagnostic accuracy (t-tests) and qualitative analysis of interview responses. The result of the findings shows that system administrators with rootkit detection skills outperformed their counterparts without these skills in identifying and mitigating complex system vulnerabilities caused by rootkits. It was recommended that system administrator training programs prioritize rootkit detection to prepare staff for increasingly sophisticated cyber threats. This study is related to the present study as the both investigated rootkit detection skills that improved troubleshooting techniques for system administrators.

Statement of the Problem

In today's interconnected digital world, the academics institutions and business operators are heavily relying on computer systems to manage multitasking operations, store sensitive information, facilitate communication and enhances student practical in the laboratory. However, the pervasive threat of computer virus attacks poses fears and significant challenges to maintaining system integrity within educational institutions. Clifford (2023) confirmed that the integrity of academic operations suffered unexpected system breakdown as a result of devastated virus attack by cybercriminals, this is because of inadequate diagnostic techniques skills need by the system administrators and lack of a required virus scanning skills set for preventive maintenance. The resultant effect of this attack indicating that the Federal Universities in south-south seems to lack practical oriented curriculum or the curriculum not fertile enough to contained todays demanded skills driven for efficient IT solution for teaching and learning in the region. It is against this background that the researcher was motivated to

investigate the diagnostic techniques skills need by system administrators for computer maintenance in Federal Universities in South-South, Nigeria

Purpose of the Study

The main purpose of the study was to determine the diagnostic technique skills need by system administrators for computer maintenance in Federal Universities in South- south, Nigeria. Specifically, the study sought to:

- i. Determine the antivirus software scanning skills need by system administrators for computer maintenance in Federal Universities in south-south Nigeria.
- ii. Determine the malware scanning skills need by system administrators for computer maintenance in Federal Universities in south-south Nigeria.
- iii. Determine the rootkit detector skills need by system administrators for computer maintenance in Federal Universities in south- south, Nigeria.

Significance of the study

The finding of this study would be of immense beneficial to academic institutions, system maintenance administrators, and researchers when publish.

The finding of this study would be beneficially to academic institutions by preventing loss of relevance records for policy making, enhance accountability and ensure administrative efficiency. It also helps to track student learning gaps and improve personalized feedback

The findings of this study would be of a great benefit to system maintenance administrators by enabling them identify, troubleshoot, and resolve issues leading to unexpected system breakdown while improving overall system stability.

Future researchers will find this work as a reference material when published to carry out further studies on diagnostic techniques skills need for computer maintenance by system administrators.

Research Questions

The following research questions were raised to guide the study,

- i. What is the antivirus scanning skills need by system administrators for computer maintenance in Federal Universities in south -south Nigeria?
- ii. What is the malware scanning skills need by system administrators for computer maintenance in Federal Universities in south -south Nigeria?
- iii. What is the rootkit detector skills need by system administrators for computer maintenance in Federal Universities in south -south Nigeria?

Research Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance.

Ho₁: There is no significance difference in the mean response between system administrators and expert on antivirus scanning skills need for computer maintenance in Federal Universities in south -south Nigeria.

Ho₂: There is no significance difference in the mean response between system administrators and expert on malware scanning skills need for computer maintenance in Federal Universities in south -south Nigeria.

Ho₃: There is no significance difference in the mean response between system administrators and expert on rootkit detection skills need for computer maintenance in Federal Universities in south -south Nigeria.

Methodology

Descriptive survey research design was adopted for the study. According to Best (1970) descriptive research is a condition that exist, practice that prevail, beliefs, point of view or attitude that are held, need that are ongoing, event that are felt. The study was conducted in all the Federal Universities in South-South Nigeria. South-South which comprised six states: Akwa Ibom, Bayelsa, Cross River, Delta, Edo and Rivers state. The population of the study comprised 370 respondents. The maintenance administrators constitute 277 while the lecturers (experts) is 186 respondents. The sample size of this study was 186 respondents made up of 138 maintenance administrators and 48 experts (lecturers) drawn from the eight federal Universities in south -south Nigeria. Researchers developed questionnaire captioned “Diagnosis techniques skills possessed for computer maintenance by system administrators Questionnaire” (DTSPFCMSAQ) and diagnosis technique skills need for computer maintenance by system administrators Questionnaire (DTSNFCMSAQ).

Diagnostic techniques skills possessed for computer maintenance by system administrators Questionnaire” (DTSPFCMSAQ).

The response options was 5points Likert scale stated as follows:

Very high possessed	(VHP)	-	5 points
High possessed	(HP)	-	4 points
Moderate possessed	(MP)	-	3 points
Low possessed	(LP)	-	2 point
Very low possessed	(VLP)	-	1 point

Diagnostic techniques skills need for computer maintenance by experts (lecturers) Questionnaire” (DTSNFCMSAQ).

The response options was 5points Likert scale stated as follows:

Very high needed	(VHN)	-	5 points
High needed	(HN)	-	4 points
Moderate needed	(MN)	-	3 points
Low needed	(LN)	-	2 point
Very low needed	(VLN)	-	1 point

The instruments were subjected to face validated by three (3) experts from the Department of Computer and Robotic Education. The instrument was administered and trial tested on 30 respondents who was not part of the population of the study. Cronbach Alpha was

used to determine the internal consistency of the instrument and a coefficient index of 0.71 was obtained indicating that the instrument was reliable for the study. Eight (8) research assistants each from the eight Federal Universities in South-south was assisted in distributing the questionnaire and out of 186 copies of the questionnaires administered. A total of 183 copies of the questionnaire were returned, indicating 98.4 rate of returned.

The data collected was analyzing using Mean and improvement Need Index (INI) to answer the research questions. while the independent t-test was used in test the three null hypotheses at 0.05 level of significance using Statistical Package for Social Science (SPSS)

(a) Where the value of performance gap (PG) has a positive value (+) its was indicated that there is skill need for system administrators because the level at which the skill is required is higher than the level at which the skill is need.

(b) A negative (-) difference value implied that there is no skill need for system administrators because the level at which the system administrators can perform the skill is higher than the level at which it is required.

(c) Zero (0) indicated that there is no skill need because the level at which the skill is required is the same as the level to which the system administrators can perform.

In testing the null hypotheses, the calculated t-value was compared with t-critical value.

When the calculated t-value is greater than or equal to the t-critical, the null hypotheses (Ho) was rejected in favor of the alternative hypotheses.

Result

Results

Research Question 1: What is the antivirus scanning skill need by the system administrators for computer maintenance in Federal Universities in south -south Nigeria?

Table 1. Summary of Mean Gap Analysis of Antivirus Scanning Skill Need by the System Administrators for Computer Maintenance in Federal Universities South-South Nigeria
n=183

S/N	Items	$\bar{X}_N$	$\bar{X}_P$	$\bar{X}_N - \bar{X}_P$	Remark
1	scanning files as it appear or downloaded	3.77	3.71	0.60	SN
2	scanning files for malware	3.85	3.83	0.20	SN
3	analyzing suspicious files	3.83	3.82	0.01	SN
4	restricting ransomware activities within the system	3.80	4.02	-0.22	NSN
5	restricting virus against system attack	4.00	3.59	0.41	SN
6	safeguarding web application	4.08	3.65	0.43	SN
7	protecting email against phishing attack	4.16	3.63	0.53	SN
8	perform system monitoring against unexpected failure	4.08	3.82	0.26	SN

9	monitoring children's online activities	4.53	3.71	0.82	SN
10	safeguarding windows applications against boot sector virus attack.	4.24	3.58	0.66	SN
Cluster Mean		39.51	38.18	20.55	SN

SN =Skill Need, NSN =No Skill Need. **Source:** Field Survey, 2025.

The data presented in Table 1. indicate that all the identified items on antivirus scanning skills have their mean gap to be positive values (0.01 to 0.82), indicating that system administrator's performance level is below what is required. Except item no (4 **restricting ransomware activities within the system**) with the negative value (-0.22) which indicating that there is no skill need. The result implies that system administrators need skills on all the remaining nine (9) identified items on antivirus scanning skills for computer maintenance in Federal Universities in South -south Nigeria.

Research Question 2: What is the malware scanning skills need by the system administrators for computer maintenance in Federal Universities in south -south Nigeria?

Table 2. Summary of Mean Gap Analysis of Malware Scanning Skill Need by The System Administrators for Computer Maintenance in Federal Universities South-South Nigeria.
n =183

S/N	Items	$\bar{X}_N$	$\bar{X}_P$	$\bar{X}_N - \bar{X}_P$	Remark
11	fight and fixes trojans problems in a system	3.90	2.89	1.01	SN
12	isolates harmful code from the system	3.96	3.47	0.49	SN
13	communicates the users when malware are found in the system	3.84	2.89	0.94	SN
14	analyzing and detect worms related code in the system	3.96	2.77	1.19	SN
15	tracking spyware activities on a network	3.88	2.88	1.00	SN
16	checks folder for any available error in the system	3.94	2.84	1.10	SN
17	<i>schedule automatic</i> resources scanning against <i>ransomware</i> attack.	3.51	2.79	0.72	SN
18	<i>detecting</i> and removing <i>malicious</i> attack in the system	3.68	3.55	0.13	SN
19	perform cloud base scanning against cybercriminal	4.02	3.49	0.53	SN
20	detect and neutralizing trojans attempt in the system.	3.88	3.84	0.04	SN
Cluster Mean		38.57	31.41	7.15	SN

SN =Skill Need, NSN =No Skill Need. **Source:** Field Survey, 2025.

The data presented in table 2. indicate that all the identified items on malware scanning skills have their mean gap to be positive values (0.04) to (1.19), indicating that system administrator's performance level is below what is required. The result implies that system administrators need skills on all the identified malware scanning skills for computer maintenance in Federal Universities in south -south Nigeria.

Research Question 3. What is the rootkit detection skills need by the system administrators for computer maintenance in Federal Universities in south -south Nigeria?

Table 4. Summary of Mean Gap Analysis of Rootkit Detection Skill Need by the System Administrators for Computer Maintenance in Federal Universities South-South Nigeria
n=183

S/N	Items	$\bar{X}_N$	$\bar{X}_P$	$\bar{X}_N - \bar{X}_P$	Remark
31	comparing network traffic to known signatures	3.94	2.69	1.69	SN
32	investigate forensic digital evidence	3.86	2.79	1.09	SN
33	detecting and identifying threats by analyzing programs behaviors	2.88	3.78	0.09	SN
34	managing integrity checking by verifying software consistency	4.22	3.71	0.51	NS
35	examines computer's memory for malicious software	4.16	2.89	1.27	NS
36	analyzing kernel-level to detect malware and other security threats	3.65	3.53	0.12	SN
37	investigating system structure and content of a storage devices against attack launching	4.00	3.62	0.62	SN
38	monitoring and tracking data flows across network traffic	3.92	3.48	0.44	SN
39	analyzing hard disk for master boot record (MBR)	4.00	3.81	0.19	SN
40	check made malicious tools like key loggers and password stealers within network environment	3.84	3.67	0.17	SN
Cluster Mean		40.21	32.66	5.88	SN

SN =Skill Need, NSN =No Skill Need. **Source:** Field Survey, 2025.

The data presented in Table 3. indicate that all the identified items on rootkit detection skills have their mean gap to be positive values (0.09 to 1.127), indicating that system administrator's performance level is below what is required. The result implies that system

administrators need skills on all the identified rootkit detection skills for computer maintenance in Federal Universities in south -south Nigeria

Research Hypotheses 1: There is no significant difference in the mean response between system administrators and experts on antivirus scanning skills need for computer maintenance in Federal Universities in south -south Nigeria.

Table 4: Independent t-test Analysis of the Difference in the Mean Responses of System Administrators and Experts(lecturers) on Antivirus Scanning Skills Need for Computer Maintenance in Federal Universities in South - South Nigeria.

n = 183

S/N	Items	System Administrators (1)		Experts (Lecturers)(2)		t-value	p-value	Decision
		Mean1	SD1	Mean2	SD2			
1	scanning files as it appear or downloaded	3.77	1.03	3.71	0.87	0.38	0.70	No sig
2	scanning files for malware	3.85	1.20	3.83	1.14	0.10	0.92	No sig
3	analyzing suspicious files	3.83	1.14	3.82	0.76	-0.01	0.99	No sig
4	restricting ransomware activities within the system	3.80	1.09	4.02	0.80	-1.29	0.20	No sig
5	restricting virus against system attack	4.00	1.34	3.59	0.58	-2.09	0.04	Sig
6	safeguarding web application	4.08	1.20	3.65	0.90	-2.31	0.02	Sig
7	protecting email against phishing attack	4.16	1.22	3.63	0.69	-2.92	0.04	Sig
8	perform system monitoring against unexpected failure	4.08	1.15	3.82	0.78	2.07	0.04	Sig
9	monitoring children's online activities	4.53	1.19	3.71	0.68	-4.59	0.01	Sig
10	safeguarding windows applications against boot sector virus attack.	4.24	1.27	3.58	0.69	-3.48	0.01	Sig

Not sig= No Significant, Sig = Significant, df = 181, P = 0.05. **Source:** Field Survey, 2025

The result in Table 4. shows the independent t-test analysis difference in the mean response and system administrators and experts on antivirus scanning skills for computer maintenance in Federal Universities in South-South Nigeria. The result revealed that out of the ten items assessed, six items (Items 5, 6, 7, 8, 9, and 10) yielded statistically significant differences in mean scores between the two groups, with p-values less than the conventional

alpha level of 0.05. Conversely, the remaining items (Items 1, 2, 3, and 4) showed no statistically significant differences, as evidenced by p-values exceeding 0.05. This implies that the research hypothesis one was rejected, hence there is significant difference in the mean response between system administrators and expert on antivirus scanning skills need for computer maintenance in Federal Universities in south -south Nigeria.

Research hypotheses 2: There is no significant difference in the mean response between system administrators and experts on malware scanning skills need for computer maintenance in Federal Universities in south -south Nigeria.

Table 5 Independent t-test Analysis of the Difference in the Mean Responses of System Administrators and Experts(lecturers) on Malware Scanning Need for Computer Maintenance in Federal Universities in South -South Nigeria.

		n = 186							
S/N	Item	System -(1) administrator				Experts (lectures) (2)			
		Mean 1	SD1	Mean 2	SD2	t	-value	p-value	
Decision									
11	fight and fixes trojans problems in a system	3.90	1.20	2.89	1.05	1.69	0.09	Sig	
12	isolates harmful code from the system	3.96	1.26	3.47	0.99	2.45	0.015	Sig	
13	communicates the users when malware are found in the system	3.84	1.06	2.89	0.94	0.64	0.53	Sig	
14	analyzing and detect worms related code in the system	3.96	1.15	2.77	1.09	1.28	0.22	Sig	
15	tracking spyware activities on a network	3.88	1.24	2.88	0.89	1.41	0.16	Sig	
16	checks folder for any available error in the system	3.94	1.15	2.84	1.13	2.09	0.07	Sig	
17	schedule automatic resources scanning against ransomware attack.	3.51	1.13	2.79	1.33	0.034	0.55	Sig	
18	detecting and removing malicious attack in the system	3.68	1.11	3.55	1.17	0.67	0.50	Not sig	
19	perform cloud base scanning against cybercriminal	4.02	0.97	3.49	0.95	2.57	0.01	Sig	
20	detect and neutralizing trojans attempt in the system.	3.88	1.144	3.84	1.048	0.235	0.815	Not sig	

Not = Not Significant, Sig= Significant, df = 181, P = 0.05 **Source:** Field Survey, 2025

The result in Table 5. shows the independent t-test analysis difference in the mean response of system administrators and experts on malware scanning skills for computer maintenance in Federal Universities in South-South Nigeria. The result revealed that out of the ten items assessed, six items (Items 11, 12, 14, 15, 16, 17 and 19) yielded statistically significant differences in mean scores between the two groups, with p-values less than the conventional alpha level of 0.05. Conversely, the remaining items (Items 18 and 20) showed no statistically significant differences, as evidenced by p-values exceeding 0.05. This implies that the research hypothesis two was rejected, hence there is significant difference in the mean response between system administrators and expert on malware scanning skills need for computer maintenance in Federal Universities in south -south Nigeria.

Research Hypotheses 3

There is no significant difference in the mean response between system administrators and expert on rootkit detection skills need for computer maintenance in Federal Universities in south -south Nigeria.

Table 6: Independent t-test Analysis of the Difference in the Mean Responses of System Administrators and Experts(lecturers) on Rootkit Detection Skills Need for Computer Maintenance in Federal Universities in South -South Nigeria.

S/N	Items	System (1) administrators				Experts (Lectures) (2)		p- value	Decision
		Mean1	SD1	Mean2	SD2	t- value			
31	comparing network traffic to known signatures	3.94	1.06	2.69	0.92	-1.31	0.19		Sig
32	investigate forensic digital evidence	3.86	1.05	2.79	0.96	-0.07	0.95		Sig
33	detecting and identifying threats by analyzing programs behaviors	2.88	1.05	3.78	1.12	-0.35	0.73		Sig
34	managing integrity checking by verifying software consistency	4.22	1.16	3.71	0.89	-2.85	0.05		Sig
35	examines computer's memory for malicious software	4.16	0.97	2.89	1.07	-1.72	0.07		Sig
36	analyzing kernel-level to detect malware and other security threats	3.65	1.15	3.53	0.97	-0.62	0.52		Not sig

37	investigating system structure and content of a storage devices against attack launching	4.00	1.05	3.62	0.99	-2.45	0.02	Not Sig
38	monitoring and tracking data flows across network traffic	3.92	1.12	3.48	0.99	-2.48	0.01	Sig
39	Event analysis to evaluate specific event	4.00	0.95	3.81	0.98	-1.20	0.23	Not sig
40	Evaluate the impact of a specific event	3.84	1.13	3.67	0.85	-0.95	0.35	Not sig

Not = Not Significant, Sig = Significant, df = 182, P = 0.05. **Source:** Field Survey, 2025

The result in Table 6. shows the independent t-test analysis difference in the mean response of system administrators and experts on rootkit detection skills for computer maintenance in Federal Universities in South-South Nigeria. The result revealed that out of the ten items assessed, six items (Items 31,32,33,34,35 and 38) yielded statistically significant differences in mean scores between the two groups, with p-values less than the conventional alpha level of 0.05. Conversely, the remaining items (Items 36, 37, 39 and 40) showed no statistically significant differences, as evidenced by p-values exceeding 0.05. This implies that the research hypothesis four was rejected, hence there is significant difference in the mean response between system administrators and expert on rootkit detection skills need for computer maintenance in Federal Universities in south -south Nigeria.

Discussion of Findings

Antivirus Scanning Skills and Computer Maintenance

The findings on research question one revealed that system administrators need antivirus scanning skills which include: scanning files as it appear or downloaded, **scanning files for malware**, analyzing suspicious files, **quarantining for restriction of virus**, safeguarding web application, **protecting email against phishing attack**, **performing system monitoring against unexpected failure**, parenting monitoring children online activities, ensuring lager security within applications for computer maintenance in Federal Universities in South -south Nigeria. Also the hypothesis one revealed that there is significant difference in the mean response between system administrators and expert on antivirus scanning skills need for computer maintenance in Federal Universities in south -south Nigeria. This finding is in agreement with the finding of Ali and Noor (2022) who postulated that the antivirus scanning skills is highly effective in detecting malware in computer system.

Malware Scanning Skills and Computer Maintenance

The findings on research question two revealed that system administrators need malware scanning skills which include: tracking network activities, isolating potentially harmful code from the system, *analyzing data related to securities*, updating installs software patches, *assigning resources to perform task*, *detecting and remove* viruses from the system,

disabling cybersecurity tools communicating users when threat are found. Also the research hypothesis two revealed that there is significant difference in the mean response between system administrators and expert on malware scanning skills need for computer maintenance in Federal Universities in south -south Nigeria. This finding is in support with the finding of **Johnson and Johnson (2020)** who postulated that technicians with advanced malware scanning skills significantly improved their ability to identify and resolve malware-related issues quickly.

Rootkit detection Skills and Computer Maintenance

The findings on research question three revealed that system administrators need skills on rootkit detection skill which include: detection of signatures, investigate digital evidence, malicious behavior detection, kernel analysis for threat security, investigation of storage system, boot sector examination, event analysis *and evaluation of specific event*. Also the result of the finding of hypothesis three shows that there is significant difference in the mean response between system administrators and expert on rootkit detection skills need for computer maintenance in Federal Universities in south -south Nigeria. This finding agree with the finding of Zhang and Tang (2020) who postulated that IT security professionals who trained on rootkit detection tools were able to reduce diagnostic time by 25% and improve the accuracy of identifying rootkit infections by 40%.

Conclusion

It was concluded that system maintenance administrators need diagnostic techniques skills for maintenance of computer in Federal Universities in south -south Nigeria.

Recommendations

Based on the finding of this study, the following recommendation were made:

- i. The academics institutions should regularly organize seminars and workshops on the rudiment of antivirus scanning skills for system administrators and experts(lecturers) for more knowledge relevant to university operations.
- ii. The management of academic institutions in south –south Nigeria should ensure that the employees majorly those in ICT and portal management unit are frequently trained on diagnostic techniques skills operations.
- iii The management should focus more on system security and safety to ensure the smooth running of the institutions in south–south Nigeria.

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