

## **Information Security in the Optimization of Web Servers in the OTIC of the FIIS-UNAC, 2022**

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### **Abstract**

*This research was carried out on the security of web servers in the Information and Communication Technology Office (OTIC) of the Faculty of Industrial and Systems Engineering (FIIS); It must be established through operating and use rules, to guarantee the protection and availability of the information of the computing infrastructure and computer resources.*

*Provide and guarantee a level of security, reduce information security risks efficiently and adapted to changes that occur in risks, the environment and in application servers works with a web server to handle content requests dynamic, such as servlets, of web applications. A web server uses a web server plug-in to establish and maintain persistent HTTP and HTTPS connections with an application server.*

*The web server process is an example of the client/server model. All computers that have websites must have web server software.*

*In the Information and Communication Technology Office of the Faculty of Industrial and Systems Engineering; Web servers are used in web hosting or data hosting for websites and web-based applications, or web applications.*

**Keywords:** *information security, security testing, web server, optimization, vulnerabilities.*

### **INTRODUCTION**

Nowadays the internet service has become a very important and powerful tool, in organizations, the insecurity of computer systems, networks; It is based on technological deficits, policy deficits regarding security and configuration deficits.

At UNAC there are 11 Faculties, currently there is the OTIC, which provides Technological support to the Faculties and agencies. The OTIC; is responsible for the design, development, acquisition, implementation, integration, maintenance,

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documentation and evaluation processes of the information systems and technological infrastructure of the National University of Callao.

The Information and Communication Technology Office of the Faculty of Industrial and Systems Engineering; has the need to return to semi-face-to-face classes and does not have updated technology to be able to attend to the different offices given that it does not have a development area, equipped support, trained personnel to provide solutions to the various problems of daily tasks in the Faculty, this results in a service that is not satisfied and timely for students.

The information from the various areas of the Faculty is isolated, they do not have a centralized database, there are no backup copies, they do not have directives, information security protocols, or biosafety protocols.

In this context, the Information and Communication Technology Office of the Faculty of Industrial and Systems Engineering; It does not have a web server that guarantees secure and error-free communication between the server and the client for the administrative and academic management of the students.

In this context, it is vitally important to address this need since we are entering the stage of blended presence in the various academic and administrative activities; In this sense, it is required to have a Virtual Private Server on Google Cloud Platform, an Educational Website System on a WordPress platform, a Facebook-type Social Network System and have weekly backups of all systems, all of this to guarantee the security of the Information with a set of preventive measures and procedures that control the processing of data used in the Information and Communication Technologies Office of the Faculty of Industrial and Systems Engineering.

This is where the research questions are formulated:

To what extent does an information security system optimize the web servers in the OTIC of the FIIS of the UNAC 2022?

And the specific problems:

1. To what extent does an information security system optimize the functionality of web servers in the UNAC 2022 FIIS OTIC?
2. To what extent does an information security system optimize the reliability of web servers in the UNAC 2022 FIIS OTIC?
3. To what extent does an information security system optimize the efficiency of web servers in the UNAC 2022 FIIS OTIC?

Which lead us to the following objectives:

General objective

Evaluate to what extent an information security system optimizes web servers in the OTIC of the FIIS of the UNAC 2022.

Specific objectives

1. Establish to what extent an information security system optimizes the functionality of web servers in the OTIC of the FIIS of the UNAC 2022?
2. Establish to what extent an information security system optimizes the reliability of web servers in the OTIC of the FIIS of the UNAC 2022?
3. Establish to what extent an information security system optimizes the efficiency of web servers in the OTIC of the FIIS of the UNAC 2022?

## **THEORETICAL FRAMEWORK**

### Information System (IS)

They are all the cataloged preventive and reactive measures of the person, the organization and the technological systems that safeguard and protect all information, maintaining its confidentiality, authenticity and integrity.

### Informatic security

It is the step by step of preventing and detecting unauthorized access to a computer system. This includes the process of protecting against intruders who use our computing resources for malicious or for-profit purposes, or even accidentally access them. This includes the process of protecting against intruders who use our computing resources for malicious or for-profit purposes, or even accidentally access them. The points covered by computer security are:

Confidentiality: only authorized people can access resources, data and information.

Integrity: only authorized people can modify the data when it is really necessary.

Availability: availability of data when necessary.

Authentication: truly communicating what is real and true.

### Web server

A web server is software and hardware that uses the HTTP (Hypertext Transfer Protocol) and other protocols to respond to client requests made over the World Wide Web. The main function of a web server is to display the content of a website by storing, processing and delivering web pages to users. In addition to HTTP, web servers also support SMTP (Simple Mail Transfer Protocol) and FTP (File Transfer Protocol), used for email, file transfer, and storage.

### Security System (Intelligent ICI ConstrolsInc)

Web servers, due to their structure, open a window between your network and the world. The protection you have with the maintenance, updating and coding of your website will define the size of said window. It must be emphasized that all web security can be relative and must always be accompanied by two elements: one internal and one public.

Cybersecurity is relevant because websites that are not protected will be vulnerable to events such as:

- Theft of information that is stored on the web server.
- All personal data, such as email addresses and transfer information for payment to third parties, can then be used inappropriately (identity theft, types of extortion, excess or abuse of trust, other scams, etc.).
- Redirect inappropriate and malicious web pages.
- Publicize unwanted ads.
- Send false data to bots and/or search engine crawlers to do “black hat” SEO, aiming to attract traffic to websites that do not conform to web practices. .
- Make use of foreigners' computers to mine cryptocurrencies.
- Be the recipients of DDoS attacks that could attack your page, causing it to stop working unexpectedly, making it inaccessible to outsiders.
- Make malicious software downloads.

## **HYPOTHESES AND VARIABLES**

General hypothesis

An information security system optimizes the web servers in the OTIC of the FIIS of the UNAC 2022.

Specific hypotheses

1. An information security system optimizes the functionality of the web servers in the OTIC of the FIIS of the UNAC 2022.
2. An information security system optimizes the reliability of the web servers in the OTIC of the FIIS of the UNAC 2022.
3. An information security system optimizes the efficiency of web servers in the OTIC of the FIIS of the UNAC 2022.

## **MATERIALS AND METHODS**

Methodological design.

The process that was designed to achieve the objectives set in the research is described.

The present research is of an applied and descriptive type, in which way the variables and their properties are manifested, as well as how information is collected about each of them and it is of a descriptive type because facts and characteristics of an object of study are shown and identified.

Research method

The research method is quantitative, because a numerical value will be assigned to the findings, in the same way descriptive statistical tables of the study variable will be presented.

Research designs are created through surveys. An evaluation tool is used to display and analyze the research conducted in a tabular format. Variables are analyzed and evaluation tools are used.

In research, the design is experimental. Because it is the process of subjecting an object or group of people to certain conditions, stimuli, or treatments of independent variables and then applying measures to determine their effect on the observed dependent variable. (Fidias G. Arias,2012).

Population and sample

Population

This study limits its scope of work at UNAC, at the FIIS; the OTIC that provides information service and technological support to the various offices and/or dependencies; being a total of 30 administrative workers.

This allows you to draw statistical conclusions about the teaching population in question with a confidence level of 95% and a precision error of 5%.Sample

This research is limited in its scope of work in the OTIC of the Faculty; that provides information service and technological support to the various offices and/or dependencies; considering as part of the research, a sample of 12 people.

Place of study and period developed

The present study will be carried out at the UNAC, in the OTIC of the FIIS, with a duration of 6 months.

Techniques and instruments for collecting documentary information

The method used is research considering limited time and resources, it was created from a survey conducted with department and field personnel of the FIIS.

A pre-designed questionnaire was applied based on the research objectives to allow the direct capture of information for processing and results.

Data analysis and processing

For the research, the statistical treatment was carried out and the data was collected, grouping it and the statistics were developed using the Excel program and the SPSS 17 Statistical Program. It was necessary to prepare the frequency tables, appreciating the data that are kept in mind. form of quantities, as well as percentages, and subsequently the graphs that correspond to the information that was obtained are presented and then a description of the interpretation of the information is made.

Proposal for the implementation of an information security system to optimize web servers in the Faculty's Information and Communications Technologies office.

Currently the world faces a rapid development supported by new technologies, with great influence of IT and communications, allowing all users to access remote resources in order to take full control of them without having the need for a physical presence.

This study shows us how to optimize the so-called processing times and the display of information in a System's Web browser, using simple configurations on the Apache server. These configurations are made specifically based on data compression and cache management. The time savings directly affects a better perception on the part of every user regarding the usability of the system.

**RESULTS**

Inferential results of the V.D: WEB SERVER

Normality Test

The normality test was used to check the distribution of the data. In this research, 12 data were processed, which comes from the difference between before and after, which is why the Shapiro-Wilk test was chosen, with the following decision rule:

If the significance is > 0.05, the sample behavior is a normal distribution, and the T-Student test statistic is chosen.

If the significance is < 0.05, the behavior of the sample is a non-normal distribution. and the non-parametric Wilcoxon test statistic is chosen.

Table 1: Normality Test

	Normality tests					
	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistical	gl	Sig	Statistical	gl	Sig
WEB_SERVER_DIFFERENCE	,119	12	,200*	,959	12	,766
*. This is a lower limit of true significance.						
a. Correction of meanings of Lilliefors						

In table 1, the significance has a value of 0.766, this being > 0.05, therefore, the data come from a normal distribution, so the T-Student test was chosen for the hypothesis test.

Hypothesis Testing of the Dependent Variable

Ho: An information security system does not optimize the web servers in the OTIC of the FIIS of the UNAC 2022

H<sub>a</sub>: An information security system optimizes the web servers in the OTIC of the FIIS of the UNAC 2022

Decision rule

H<sub>0</sub>:  $\mu_{pa} = \mu_{pd}$

H<sub>a</sub>:  $\mu_{pa} < \mu_{pd}$

Table 2: Statistics of paired productivity samples

Paired Sample Statistics					
		Half	N	Dev. Deviation	Dev. Average error
Pair 1	WEB_SERVER_AFTER	95,2050	12	3,61850	1,04457
	WEB_SERVER_BEFORE	62,5900	12	3,75987	1,08538

Table 3: Paired productivity differences

Paired Sample Statistics									
		Paired differences					t	gl	Sig (bilateral)
		Half	Dev Deviation	Dev Average error	95% confidence interval of the difference				
					Lower	Superior			
Pair 1	WEB_SERVER_AFTER WEB_SERVER_BEFORE	32,61500	4,20201	1,21302	29,94517	35,28483	26,888	11	,00

In table 3: we observe that the result resulting from the following. (Bilateral) results in 0.000 being < 0.05, therefore, the null hypothesis (H<sub>0</sub>) is rejected and the alternative hypothesis (H<sub>a</sub>) is accepted, with the improvement of the average of the web server being 32.615%, there being a difference significant, concluding that: An IS system optimizes the web servers in the OTIC of the FIIS of the UNAC 2022, will increase to a significant extent of 32.615%

Specific hypothesis test 1

Normality Test

The Shapiro-Wilk normality test was used, therefore, the sample used is <30 workers in whom the study was carried out for this test. Describing it in the following hypothesis for the productivity in which the difference was worked on:

If the P-value is > 0.05, the sample data comes from a normal distribution, accepting the H<sub>0</sub>.

If the P-value is < 0.05, the sample data does not come from a normal distribution, we accept the H<sub>a</sub>.

Table 4: Test of normality of the efficiency indices

Normality tests						
	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistical	gl	Sig	Statistical	gl	Sig
DIFFERENCE_FUNCTIONALITY	,187	12	,200*	,908	12	,200
*. This is a lower limit of true significance.						
a. Correction of meanings of Lilliefors						

In table 4, the significance has a value of 0.200, this being > 0.05, therefore, the data come from a normal distribution, so the T-Student test was chosen for the hypothesis test.

Validation of Specific Hypotheses of the Dependent variable

Ho: An information security system does not optimize the functionality of the web servers in the OTIC of the FIIS of the UNAC 2022

Ha: An information security system optimizes information optimizes the functionality of web servers in the OTIC of the FIIS of the UNAC 2022

Decision rule

H<sub>0</sub>:  $\mu_{pa} \geq \mu_{pd}$

H<sub>a</sub>:  $\mu_{pa} < \mu_{pd}$

Table 5: Statistics of paired samples efficiency indices

Paired Sample Statistics					
		Half	N	Dev. Deviation	Dev. Average error
Pair 1	FUNCTIONALITY AFTER	92,3217	12	2,29320	,66199
	FUNCTIONALITY BEFORE	64,0183	12	3,12801	,90298

Table 6: Paired differences efficiency indices

Paired Sample Statistics									
		Paired differences					t	gl	Sig (bilateral)
		Half	Dev Deviation	Dev Average error	95% confidence interval of the difference				
					Lower	Superior			
Pair 1	FUNCTIONALITY AFTER - FUNCTIONALITY BEFORE	28,30333	4,27578	1,23431	25,58663	31,02004	22,930	11	,000

In table 6, we observe that the result obtained from sig. (Bilateral) results in 0.000 being < 0.05, rejecting the null hypothesis (Ho) and accepting the alternative hypothesis (Ha), with an improvement in the average in the index of 28.30%, so there is a significant difference in the indices, concluding that: An IS system optimizes the functionality of the web servers in the OTIC of the FIIS of the UNAC 2022.

Specific hypothesis test 2

Normality Test

The normality test was used to check the distribution of the data. In this research, 12 data were processed, which comes from the difference between before and after, which is why the Shapiro-Wilk test was chosen, with the following decision rule:

If the significance is > 0.05, the sample behavior is a normal distribution, and the T-Student test statistic is chosen.

If the significance is < 0.05, the behavior of the sample is a non-normal distribution. and the non-parametric Wilcoxon test statistic is chosen.

Table 7: Test of normality of the Efficacy Indices

Normality tests						
	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistical	gl	Sig	Statistical	gl	Sig
DIFFERENCE_EFFICIENCY	,189	12	,200*	,891	12	,121
*. This is a lower limit of true significance.						
a. Correction of meanings of Lilliefors						

In table 7, the significance has a value of 0.121, this being  $> 0.05$ , therefore, the data come from a normal distribution, so the T-Student test was chosen for the hypothesis test.

Validation of Specific Hypotheses of the Dependent variable

$H_0$ : An information security system does not optimize the efficiency of web servers in the OTIC of the FIIS of the UNAC 2022

$H_a$ : An information security system optimizes the efficiency of web servers in the OTIC of the FIIS of the UNAC 2022

$H_0: \mu_{pa} = \mu_{pd}$

$H_a: \mu_{pa} < \mu_{pd}$

Table 8: Statistics of paired samples efficacy indices

Paired Sample Statistics					
		Half	N	Dev Deviation	Dev Average error
Pair 1	EFFICIENCY AFTER	95,1483	12	2,31039	,66695
	EFFICIENCY BEFORE	62,7900	12	2,89808	,83660

Table 9: Diferencias emparejadas índices de eficacia

Paired Sample Statistics									
		Paired differences					t	gl	Sig (bilateral)
		Half	Dev Deviation	Dev Average error	95% confidence interval of the difference				
					Lower	Superior			
Pair 1	EFFICIENCY AFTER-EFFICIENCY BEFORE	32,35833	4,27125	1,23300	29,64451	35,07216	26,243	11	,000

In table 9, we observe that the result obtained from the following. (Bilateral) results in 0.000 being  $< 0.05$ , rejecting the null hypothesis ( $H_0$ ) and accepting the alternative hypothesis ( $H_a$ ), with an average improvement in the index of 32.35%, with a significant difference in the indexes, concluding that: An IS system optimizes the efficiency of web servers in the OTIC of the FIIS of the UNAC 2022

## CONCLUSIONS

1.-The application of an information security system optimizes the web servers in the OTIC of the FIIS of the UNAC 2022, where the increase is demonstrated to a significant extent of 32.615%



2.- The application of an information security system optimizes the functionality of the web servers in the OTIC of the FIIS of the UNAC 2022, where the increase is demonstrated to a significant extent of 28.30%.

3.- The application of an information security system optimizes the reliability of the web servers in the OTIC of the FIIS of the UNAC 2022, where the increase is demonstrated to a significant extent of 32.78%.

4.- The application of an information security system optimizes the efficiency of the web servers in the OTIC of the FIIS of the UNAC 2022, where the increase is demonstrated to a significant extent of 32.35%.

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