



UNDERGRADUATE THESIS

Security Testing of PT. XYZ E-Commerce Website Using PTES Method Based on NIST SP 800-115 and OWASP Top 10

ARIF SETYO WIBOWO

NPM 21081010057

THESIS ADVISORS

Henni Endah Wahanani, S.T., M.Kom.

Andreas Nugroho Sihananto, S.Kom., M.Kom.

**MINISTRY OF HIGHER EDUCATION, SCIENCE, AND TECHNOLOGY
UNIVERSITAS PEMBANGUNAN NASIONAL VETERAN JAWA TIMUR
FACULTY OF COMPUTER SCIENCE
INFORMATICS STUDY PROGRAM
SURABAYA
2026**

APPROVAL SHEET


**Security Testing of PT. XYZ E-Commerce Website Using PTES Method
Based on NIST SP 800-115 and OWASP Top 10**

By:
ARIF SETYO WIBOWO
NPM. 21081010057

Has been defended before, and accepted by, the Board of Assessors of the Thesis Examination of the Informatics Study Program, Faculty of Computer Science, Universitas Pembangunan Nasional Veteran Jawa Timur, on June 15, 2026:

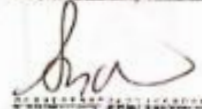
Approved,

Henni Endah Wahanani, S.T., M.Kom.
NIP. 19780922 2021212 005



(Advisor I)

Andreas Nugroho S., S.Kom., M.Kom.
NIP. 19900412 202406 1 003



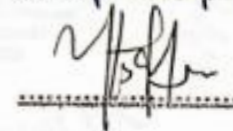
(Advisor II)

M. Muharrom Al Haromainy, S.Kom., M.Kom.
NIP. 19950601 202203 1 006



(Head Assessor)

Yisti Vita Via, S.ST. M.Kom.
NIP. 19860425 2021212 001



(Assessor I)

Acknowledge by,

Dean of the Faculty of Computer Science



Prof. Dr. Ir. Novirina Hendrasarie, MT.
NIP. 19681126 199403 2 001

APPROVAL SHEET

**Security Testing of PT. XYZ E-Commerce Website Using PTES Method
Based on NIST SP 800-115 and OWASP Top 10**

**By:
ARIF SETYO WIBOWO
NPM. 21081010057**

Approved to proceed to the Thesis Examination

Approved by,

**Coordinator of Informatics Study Program
Faculty of Computer Science**



Dr. Intan Yuniar Purbasari, S.Kom. MSc.

NIP. 19800602 202521 2 029

STATEMENT OF ORIGINALITY

I am the undersigned:

Student Name : Arif Setyo Wibowo
NPM : 21081010057
Degree Program : Bachelor (S1)
Study Program : Computer Science
Faculty : Faculty of Computer Science

Stating that in this scientific document of this Thesis there is no part of other scientific works that have been submitted to obtain an academic degree in a Higher Education institution, and also there are no works or opinions that have ever been written or mentioned in full in the bibliography.

And I declare that this scientific document is free from elements of plagiarism. If in the future indications of plagiarism are found in this Thesis, I am willing to accept sanctions in accordance with the applicable laws and regulations.

Thus, I made this statement without any coercion from anyone and to be used as it should.

Surabaya, June 15, 2026
Declarant,



Arif Setyo Wibowo
NPM. 21081010057

ABSTRACT

Thesis Title / NPM : Arif Setyo Wibowo / 21081010057
Thesis Title : Security Testing of an E-Commerce Website Using
the PTES Method Based on NIST SP 800-115 and
OWASP Top 10
Supervisor : 1. Henni Endah Wahanani, S.T., M.Kom.
2. Andreas Nugroho Sihananto, S.Kom., M.Kom.

The rapid growth of e-commerce in Indonesia has led to an increase in cybersecurity threats, with the National Cyber and Crypto Agency (BSSN) recording 610.63 million cyberattacks throughout 2024. PT. XYZ, a mattress manufacturer that recently launched its first e-commerce platform, has received 18,788 visitors in the first three months since launch, yet has never undergone any security testing, potentially exposing both the company and its customers to significant risks.

This study aims to identify security vulnerabilities in the PT. XYZ e-commerce website using the Penetration Testing Execution Standard (PTES) method, carried out through seven stages from pre-engagement to reporting, guided by NIST SP 800-115 as the technical reference and OWASP Top 10 as the vulnerability classification framework. Automated scanning using OWASP ZAP identified 48 alerts consisting of 1 High, 14 Medium, 19 Low, and 14 Informational. The 14 Informational alerts were excluded as they did not indicate exploitable security weaknesses. Combined with 3 findings from manual scanning, a total of 37 vulnerabilities were successfully mapped to the OWASP Top 10 2021 categories, comprising 1 High, 16 Medium, and 20 Low.

Of the 37 findings, six vulnerabilities were actively exploited: Clickjacking, CSP Header Not Set, Vulnerable JS Library, Cross-Domain Misconfiguration, Source Code Disclosure, and Username Enumeration & Brute Force. Five of these were categorized as medium risk and one as high risk. Each finding is accompanied by technical remediation recommendations to serve as a mitigation basis for PT. XYZ.

Keywords: Penetration Testing, PTES, OWASP Top 10, NIST SP 800-115, E-Commerce, Website Security

ACKNOWLEDGEMENTS

Praise be to Allah SWT for all His graces, guidance, and gifts to the author so that the thesis proposal with the title "Security Testing of an E-Commerce Website Using the PTES Method Based on NIST SP 800-115 and OWASP Top 10" can be completed successfully.

The author would like to thank Mrs. Henni Endah Wahanani, S.T., M.Kom. as Thesis Supervisor I, who has consistently provided encouragement and guided the author on how to approach and carry out the thesis properly, and Mr. Andreas Nugroho Sihananto, S.Kom., M.Kom. as Thesis Supervisor II, who has directed the author to maintain clarity of thought and guided the proper implementation of the research methodology. Furthermore, throughout the preparation of this thesis, the author also received great assistance from various parties. For this the author would like to thank the:

1. Mr. Prof. Dr. Ir. Akhmad Fauzi, MMT., IPU. as the Rector of the "Veteran" National Development University of East Java
2. Mrs. Prof. Dr. Ir. Novirina Hendrasarie, M.T. as the Dean of the Faculty of Computer Science, National Development University "Veteran" East Java.
3. Mrs. Dr. Intan Yuniar Purbasari, S.Kom. MSc. as the Coordinator of Informatics Study Program, Faculty of Computer Science, National Development University of East Java.
4. All lecturers of the Informatics Study Program, Faculty of Computer Science, National Development University, East Java, "Veterans", for all the knowledge given to the author during the lecture period. Hopefully the writer can practice the knowledge that has been given and will be a useful provision for writers in the future.
5. My beloved Father and Mother, who have provided both material and non-material support, and who have never ceased to pray for the author in every circumstance. Your sacrifices, dedication, and unconditional love have been the greatest source of strength throughout this journey. This thesis is the author's humble way of saying thank you for everything you have given and everything you have endured.

6. Diego Athalla Samudero, who has always been there to provide moral support throughout the author's journey, offering encouragement in moments of doubt. Your presence and support have meant more than words can express.
7. Muhammad Ulin Nuha Al-Firas Manar, who kindly lent his belongings for the author's needs during the proposal and final thesis presentations, and who also provided moral support throughout the process.
8. Okky Firmansyah Ramadhan, who inspired and motivated the author to build the Itboy business during college years. The experience gained through that journey has not only shaped the author's entrepreneurial mindset but also taught valuable lessons in resilience, teamwork, and problem-solving that have carried through to the completion of this thesis.
9. M. Bayu Nasrullah and Rino Zakaria, who have always provided valuable words of motivation and whose presence has meant a great deal to the author throughout the completion of this thesis.
10. Egiofani renedio, thank you
11. Rizky Amanda, who has changed the way the author thinks and sees things, leaving a meaningful impact on the author's mindset to this day.

The author realizes that in the preparation of the following thesis there are many shortcomings. For this reason, constructive criticism and suggestions from all parties are highly expected for the perfection of writing the following thesis. Finally, with all the limitations that the author has, hopefully the following report can be useful for all parties in general and the author in particular.

Surabaya, June 12, 2026

Author

TABLE OF CONTENTS

APPROVAL SHEET	i
APPROVAL SHEET	ii
STATEMENT OF ORIGINALITY	ii
ABSTRACT	iii
ACKNOWLEDGEMENTS	v
TABLE OF CONTENTS	vii
LIST OF FIGURES	x
LIST OF TABLES	xii
LIST OF APPENDICES	xiii
CHAPTER I INTRODUCTION	1
1.1. Background	1
1.2. Problem Formulation	3
1.3. Research Objectives	3
1.4. Research Benefits	4
1.5. Research Limitations	4
CHAPTER II LITERATURE REVIEW	5
2.1 Previous Research	5
2.2 PT. XYZ	7
2.3 E-Commerce Website	8
2.4 Penetration Testing	8
2.5 Penetration Testing Execution Standart (PTES)	9
2.6 NIST SP 800-15	11
2.6.1 <i>Planning</i>	12
2.6.2 <i>Discovery</i>	12
2.6.3 <i>Attack</i>	12
2.6.4 <i>Reporting</i>	13
2.7 OWASP Top 10	13
2.8 Supporting Tools	17
2.8.1 Kali Linux	17
2.8.2 OWASP Zed Attack Proxy (ZAP)	18
2.8.3 Burp Suite	19
2.8.4 Nmap	19

2.8.5	Wffuz.....	20
2.8.6	Wappalyzer	21
2.9	Penetration Testing Techniques.....	21
CHAPTER III RESEARCH METHODOLOGY		27
3.1	Research Stages.....	27
3.2	Literature Study.....	28
3.3	Research Object Analysis	29
3.4	Detailed Research Phases.....	30
CHAPTER IV RESULTS AND DISCUSSION.....		39
4.1	Pre-engagement	39
4.2	Intelligence Gathering	39
4.2.1	OSINT	40
4.2.2	Directory Mapping	43
4.2.3	Technology Mapping.....	44
4.2.4	Scanning Port dan Service	46
4.2.5	Manual Verification.....	47
4.3	Threat Modeling.....	48
4.3.1	Critical Asset Identification	48
4.3.2	Threat Actor Identification.....	49
4.3.3	Threat-to-Asset Mapping	50
4.4	Vulnerability Analysis.....	50
4.5	Exploitation	55
4.5.1	Clickjacking.....	55
4.5.2	Content Security Policy Not Set.....	58
4.5.3	Vulnerable JS Library.....	60
4.5.4	Cross-Domain Misconfiguration	62
4.5.5	Source Code Disclosure.....	64
4.5.6	Username Enumeration and Brute Force /back-auth.....	65
4.6	Post Exploitation.....	68
4.7	Reporting.....	69
4.7.1	Findings Summary	70
4.7.2	Remediation Recommendations	71
CHAPTER V CONCLUSION.....		87

5.1 Conclusion.....	87
5.2 Recommendations.....	88
REFERENCES.....	89
APPENDICES.....	93

LIST OF FIGURES

Figure 2.1 OWASP Categories 2017 - 2021.....	14
Figure 2.2 Kali Linux Interface	17
Figure 2.3 ZAP User Interface	18
Figure 2.4 Burp Suite User Interface	19
Figure 2.5 Nmap Features Overview	19
Figure 2.6 Wfuzz Interface.....	20
Figure 2.7 Wappalyzer Fingerprinting Results	21
Figure 3.1 Research Stages	27
Figure 3.2 Planning / Pre-Engagement Phase Flow	31
Figure 3.3 Intelligence Gathering Phase	32
Figure 3.4 Threat Modeling Phase Flow	34
Figure 3.5 Vulnerability Analysis Phase Flow	34
Figure 3.6 Exploitation Phase Flow	35
Figure 3.7 Post-Exploitation Phase Flow	36
Figure 3.8 Reporting Phase Flow.....	37
Figure 4.1 Results of Query site:xyz.com inurl:login.....	40
Figure 4.2 Results of Query site:xyz.com inurl:".env"	41
Figure 4.3 WHOIS Lookup Results for Domain xyz.com.....	42
Figure 4.4 wfuzz Query Results	43
Figure 4.5 Administrator Login Page at Directory /back-auth.....	44
Figure 4.6 Technology Mapping Results Using Wappalyzer	45
Figure 4.7 Port and Service Scanning Results Using Nmap	46
Figure 4.8 xyz.com Response Headers via Burp Suite.....	47
Figure 4.9 OWASP ZAP Scan Results	51
Figure 4.10 Source Code Disclosure - File Inclusion Alert Detail	54
Figure 4.11 Solution and Reference for Source Code Disclosure - File Inclusion	55
Figure 4.12 Missing Anti-clickjacking Header Vulnerability in OWASP ZAP ...	55
Figure 4.13 Burp Clickbandit Dialog	56
Figure 4.14 Burp Clickbandit Script in DevTools Console	57
Figure 4.15 Burp Clickbandit Toolbar on Target Website	57

Figure 4.16 Burp Clickbandit Toolbar	58
Figure 4.17 CSP Header Not Set Evidence in OWASP ZAP	58
Figure 4.18 xyz.com Response Headers.....	59
Figure 4.19 Shopee Response Headers	59
Figure 4.20 jQuery and Bootstrap Version Confirmation via DevTools Console	60
Figure 4.21 Vulnerable JS Library jQuery Alert in OWASP ZAP.....	61
Figure 4.22 CVE-2020-11022 Details on CVEdetails.com	61
Figure 4.23 Vulnerable JS Library Bootstrap Alert in OWASP ZAP	61
Figure 4.24 CVE-2019-8331 Details on CVEdetails.com	62
Figure 4.25 CORS Misconfiguration Alert in OWASP ZAP.....	63
Figure 4.26 CORS Misconfiguration Test Results via Burp Suite Repeater	63
Figure 4.27 Source Code Disclosure - Java Alert in OWASP ZAP	64
Figure 4.28 Laravel Error Page at /my-account/reviews	64
Figure 4.29 Payload Configuration in OWASP ZAP Fuzzer.....	65
Figure 4.30 Username Enumeration Test Results from OWASP ZAP Fuzzer	66
Figure 4.31 "User tidak ditemukan" Error Message for Invalid Username.....	66
Figure 4.32 "Password Salah" Error Message for Valid Username	67
Figure 4.33 Rate Limiting Test Results Using Python Script	67
Figure 4.34 PT. XYZ Website Response Headers After Remediation	73
Figure 4.35 Clickjacking Retest Results After Remediation	73
Figure 4.36 Response Headers After CSP Implementation	75
Figure 4.37 XSS Execution Before CSP Implementation	76
Figure 4.38 External Script Blocked After CSP Implementation.....	76
Figure 4.39 jQuery and Bootstrap Version Verification After Update	77
Figure 4.40 CORS Test Results with Official Origin After Remediation	79
Figure 4.41 CORS Test Results with Unregistered Origin	79
Figure 4.42 .env File Configuration After Remediation.....	81
Figure 4.43 404 Error Page After .env Debug false Remediation	81
Figure 4.44 Error Message Display After Remediation	82
Figure 4.45 reCAPTCHA Configuration in Google Console	83
Figure 4.46 reCAPTCHA Site Key and Secret Key.....	84
Figure 4.47 Login Page Display with reCAPTCHA	85
Figure 4.48 Rate Limiting and CAPTCHA Test Results.....	86

LIST OF TABLES

Table 3.1 Planned Testing Pages 29

Table 3.2 Testing Scope..... 31

Table 3.3 Planning Elements 32

Table 3.4 Discovery Activities and Outputs 33

Table 4.1. Pre-engagement Phase Results 39

Table 4.2 Google Dorking Query Results 41

Table 4.3 WHOIS Results 42

Table 4.4 Directory Mapping Results 43

Table 4.5 Critical Asset Identification 48

Table 4.6 Threat Actor Identification..... 49

Table 4.7 Threat-to-Asset Mapping 50

Table 4.8 Vulnerability Analysis Results Based on OWASP Top 10 51

Table 4.9 Potential Follow-up Exploits That Could Not Be Executed 68

Table 4.11 Intelligence Gathering Phase Findings..... 70

Table 4.12 Exploited Findings..... 71

Table 4.13 Post Exploitation Phase Results..... 71

LIST OF APPENDICES

Appendix 1. Research Authorization Letter	93
Appendix 2. Rules of Engagement Letter.....	94
Appendix 3. Non-Disclosure Agreement Letter	94
Appendix 4. Query Google Dorking.....	95
Appendix 5. Python Script Kode	100