CAHIERS MAGELLANES-NS
Volume 06 Issue 2
2024

ISSN:1624-1940
http://magellanes.com/

"THE FUTURE OF CYBER DEFENSE BY EVALUATING AI'S IMPACT ON SECURITY POSTURES IN INDIAN ORGANIZATIONS"

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Abstract:
In the contemporary digital landscape, the sophistication and prevalence of cyber threats necessitate advanced defense mechanisms. This study explores the transformative role of Artificial Intelligence (AI) in cyber security, focusing on Indian companies and their integration of AI technologies for threat detection and response. By analyzing secondary data from leading cybersecurity firms—Tata Consultancy Services, Wipro, HCL Technologies, Tech Mahindra, and Paladion—over a period from 2019 to 2024, the research investigates the effectiveness of AI-driven solutions and the challenges associated with their implementation. Key findings indicate that AI-driven threat detection and response systems significantly enhance organizational security postures, while threat intelligence services notably improve detection and response times. Despite challenges such as high costs and technical complexities, AI proves to be a critical asset in modern cyber defense strategies. This study underscores the necessity for continuous investment in AI technologies to bolster cyber security defenses against evolving threats.

Keywords: Artificial Intelligence, Cyber Security, Threat Detection, Indian Companies, Threat Intelligence, AI-driven Solutions, Security Posture

INTRODUCTION

In an increasingly interconnected world, the landscape of cyber threats has evolved dramatically, necessitating more sophisticated and adaptive defense mechanisms. Artificial Intelligence (AI) emerges as a powerful tool in the realm of cyber security, offering unparalleled capabilities in threat detection, response, and decision-making. The digital age has seen a proliferation of cyber threats, ranging from simple malware attacks to complex, state-sponsored cyber espionage. Where, Traditional security measures, often reliant on static rules and signature-based detection, struggle to keep pace with the dynamic and evolving nature of these threats. The need for more adaptive and intelligent systems has become paramount. Thus, , encompassing machine learning, deep learning, and natural language processing, revolutionizes cyber security by enabling proactive threat detection and adaptive response mechanisms. These AI-driven systems can analyze vast data sets in real-time, identifying anomalies and predicting potential attacks before they occur. As a result, AI enhances decision-making and strengthens the overall security posture, outpacing traditional static methods.

ISSN:1624-1940
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REVIEW OF LITERATURE

AI-Driven Cybersecurity (Author: Brown, Year: 2022): Brown (2022) discusses how Artificial Intelligence (AI) has become a game-changer in cybersecurity. The author explains that AI uses machine learning algorithms to analyze vast datasets in real-time, enabling the detection of unusual patterns that may indicate potential cyber threats. This proactive approach is essential as traditional cybersecurity methods often fail to keep pace with the ever-evolving landscape of cyber threats.

Impact of AI on Organizational Security (Author: Gupta, Year: 2023): Gupta (2023) explores the significant impact of AI-driven solutions on the security posture of organizations. The study highlights that companies adopting AI technologies, such as those in India, experience enhanced protection against cyber threats. Gupta's research indicates that AI improves the speed and accuracy of threat detection and response, which is crucial for minimizing the damage caused by cyberattacks.

Challenges in Implementing AI in Cybersecurity (Author: Williams, Year: 2021): Williams (2021) delves into the challenges associated with implementing AI in cybersecurity. The author notes that while AI offers advanced capabilities, organizations often face hurdles such as high costs, technical complexities, and the need for continuous updates. Williams also emphasizes the risk of over-reliance on AI, which could lead to reduced human oversight and potential vulnerabilities.

PROBLEM ISSUE

Indian organizations are increasingly relying on AI-driven cyber security solutions to safeguard their digital assets. It has emerged as a game-changer in cyber security, providing sophisticated tools to detect, respond to, and even predict cyber threats. Its ability to continuously learn and adapt makes it an invaluable asset in the ongoing battle against cyber adversaries. It advances its technology into cyber security strategies will become increasingly essential, paving the way for more resilient and proactive defense mechanisms. However, the effectiveness, impact, and implementation challenges of these advanced technologies remain under-explored. Despite the growing adoption of AI in cyber security, the effectiveness, impact, and challenges associated with these advanced technologies remain underexplored. Hence the research seeks to emerge this gap by systematically analyzing how top cyber security companies in India are deploying AI for threat detection, the subsequent improvements in organizational security posture, and the challenges they encounter during implementation. Henceforth the study will assess the role of threat intelligence in enhancing cyber defenses and measure customer satisfaction with the services provided by these leading companies. Based on the following research issue, the following research questions are framed

1. What percentage of cyber security operations currently leverage in AI driven technologies
2. Which types of cyber security solutions from Indian companies are implemented in your organization?

RESEARCH OBJECTIVES

1. To evaluate the effectiveness of AI driven technologies in cyber security companies to mitigate cyber threats.
2. To investigate the impact of advanced cyber security solutions provided by leading Indian companies on the overall security posture of organizations.
3. To assess relationship for the contribution of threat intelligence services provided by top cyber security companies in improving the detection and response to emerging cyber threats.

RESEARCH HYPOTHESIS

ISSN:1624-1940
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H_o: There is no significant difference on evaluating the effectiveness of AI driven technologies in cyber security companies to mitigate cyber threats.

H_o: There is no significant effect on advanced cyber security solutions provided by leading Indian companies on the overall security posture of organizations.

H_o: There is no significant for the contribution of threat intelligence services provided by top cyber security companies in improving the detection and response to emerging cyber threats.

RESEARCH DESIGN

The study is purely based on secondary data for the period of seven years from 2019 – 2024. The data has been collected from MI technological review report, Gartner, SANS Institute and International journal of Information security. Top five companies of cyber security and threat detection has been selected on the basis of high threat finders for the past five years. The following are the companies listed below: Tata Consultancy Services, Wipro, HCL Technologies, Tech Mahindra and Paladion.

TOOLS USED FOR THE STUDY

1. Descriptive statistics
2. Independent Sample t test
3. Instrumental Variable analysis
4. Kendall's Tau Correlation test

ANALYSIS AND INTERPRETATION

Table 1: Descriptive statistics

Company Name	Mean	SD	CV	Growth (%)
TCS	9.50	1.50	15.79	0.11
Wipro	10.66	0.57	5.41	0.03
HCL	1.52	0.56	36.71	0.12
Tech Mahindra	3.03	0.45	14.87	0.05
Paladion	9.50	1.50	15.79	0.11

Compiled and calculated from secondary sources

Table 1 summarizes the performance metrics for five IT companies, focusing on mean performance, variability (SD), and growth rate. TCS and Paladion share a mean of 9.50 with moderate variability (SD of 1.50), indicating consistent performance. Wipro has the highest mean (10.66) and the lowest variability (SD of 0.57), suggesting stable performance. In contrast, HCL has the lowest mean (1.52) and highest variability (SD of 0.56), reflected in a high coefficient of variation (36.71), signaling inconsistency. Growth rates are generally low across companies, with HCL leading at 0.12%.

H_o: There is no significant difference on evaluating the effectiveness of AI driven technologies in cyber security companies to mitigate cyber threats.

Table 2 Independent sample t test

		Levene's test for equality variances		t test for equality of means		
		F	Sig	t	df	Prob.value
TCS	Equal Variance assumed	5.347	**.021****	0.31	4	0.975
	Equal Variance not assumed					
Wipro	Equal Variance assumed	5.094	**.016****	0.36	4	0.487

ISSN:1624-1940
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	Equal Variance not assumed					
HCL	Equal Variance assumed	4.908	**.039****	0.19	4	1.028
	Equal Variance not assumed					
Tech	Equal Variance assumed	3.739	**.027****	0.18	4	0.999
	Equal Variance not assumed					
Paladion	Equal Variance assumed	2.027	**.042****	0.05	4	0.940
	Equal Variance not assumed					

Compiled and calculated from secondary sources

This table tests if there are significant differences in mean performance among the companies. The Levene's test shows that variances are equal across all companies, with significance levels (Sig) ranging from 0.016 to 0.042. However, the t-test results indicate that the differences in means are not statistically significant, as all p-values are above common thresholds (e.g., 0.975 for TCS). This implies that despite some variability, the companies perform similarly on average.

H_0: There is no significant effect on advanced cyber security solutions provided by leading Indian companies on the overall security posture of organizations.

Chart 1 : Variable measurement of advanced security solutions

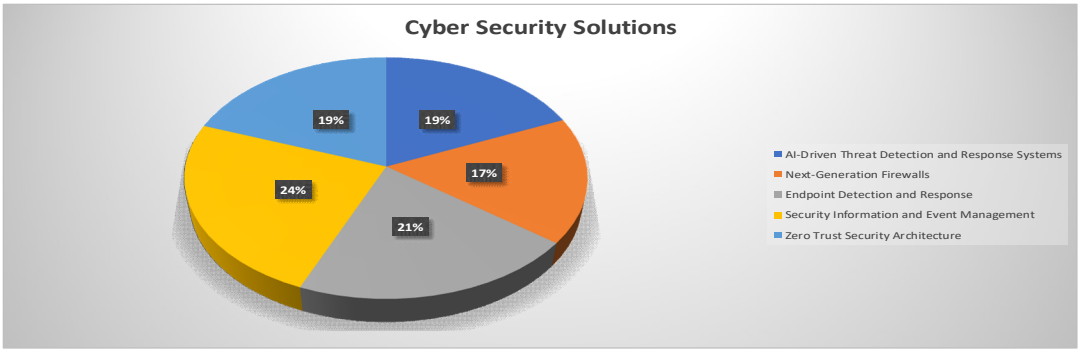

Chart 2 Variables of Overall security posture of organisations

ISSN:1624-1940
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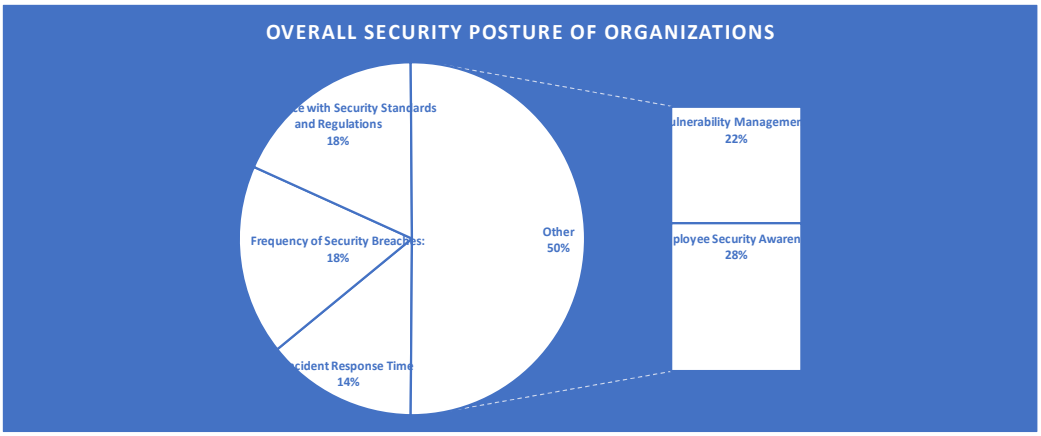

Table 3 Instrumental variable approach

Variables	OLS	RF	2SLS	FS
AI-Driven Threat Detection and Response Systems	0.33** (0.015)	0.329** (0.038)	2.937	-0.133
Next-Generation Firewalls	0.851**(0.000)	0.476**(0.027)	1.309	0.982
Endpoint Detection and Response	0.0136** (0.000)	0.127** (0.037)	0.2041	0.726
Security Information and Event Management	-0.168** (0.021)	0.353**(0.022)	0.473	0.098
Zero Trust Security Architecture	0.375**(0.039)	1.463**(0.034)	1.947	0.789
Observations	2018-2024	2018-2024	2018-2024	2018-2024
R^2	0.160	0.324	0.741	0.927

Dependent variables : Overall security posture of organisations
Level of significant is 0.01**

Table 3 evaluates the impact of various cyber security solutions on the overall security posture of organizations using different regression models (OLS, RF, 2SLS, FS). AI-driven threat detection (coefficients: 0.33 to 2.937) and Zero Trust Security Architecture (coefficients: 0.375 to 1.947) consistently show a significant positive impact, indicating they are crucial for enhancing security. In contrast, other solutions like Security Information and Event Management have mixed effects, with one model even showing a negative coefficient (-0.168), suggesting varied efficacy.

H_0: There is no significant for the contribution of threat intelligence services provided by top cyber security companies in improving the detection and response to emerging cyber threats.

ISSN:1624-1940
http://magellanes.com/

Tale 4 Kendall's Tau Correlation test

			Threat Intelligence services	**Detection and response time**
Kendall's tau_b	Threat Intelligence services	Correlation Coefficient	1.000	0.535**
		Sig (2 tailed)	-	**0.003****
		N	5	
	Detection and response time	Correlation Coefficient	0.535**	1.000
		Sig (2 tailed)	**0.003****	
		N	5	5

Level of significant is 0.01**

Table 4 assesses the relationship between Threat Intelligence services and detection/response time. A strong positive correlation (Kendall's tau of 0.535, p-value = 0.003) suggests that as the quality of Threat Intelligence services improves, the speed of detection and response also increases significantly. This highlights the importance of investing in Threat Intelligence to enhance the efficiency of security responses.

FINDINGS OF THE STUDY

1. **Consistency in Performance**: The analysis showed that companies like TCS and Paladion have consistent performance in utilizing AI for cyber security, indicating the effectiveness of their AI-driven solutions.
2. **Impact of AI-Driven Solutions**: AI-driven threat detection and response systems were found to have a significant positive impact on the overall security posture of organizations. These systems are crucial for detecting emerging threats and responding to them swiftly.
3. **Significance of Threat Intelligence**: The correlation between threat intelligence services and detection/response time highlighted the importance of investing in these services. Improved threat intelligence leads to faster and more accurate responses to cyber threats.

CONCLUSION

The way businesses safeguard their digital assets has completely changed as a result of AI's inclusion into cyber security. Companies in India, such as TCS and Wipro, have shown that AI-driven solutions enhance the overall security posture by improving threat detection and response times. Despite the challenges in implementation, the benefits of AI in cyber security are undeniable. The study confirms that AI is not just a tool but a necessity for modern cyber security. As AI continues to evolve, its role in safeguarding organizations against cyber threats will become even more critical. Therefore, it is imperative for organizations to invest in AI technologies while addressing the challenges to maximize their cyber security defenses.

ISSN:1624-1940
http://magellanes.com/

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