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Insider Threats: The Role of HR in Mitigating Internal Cyber Risks

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ABSTRACT: Insider threats represent one of the most significant and insidious challenges to organisational cybersecurity, often resulting in more devastating consequences than external attacks due to the insider's authorised access and knowledge of internal systems. These threats may stem from malicious intent, negligence, or lack of cybersecurity awareness among employees. In this context, the Human Resources (HR) department plays a pivotal yet often underemphasized role in identifying, preventing, and mitigating internal cyber risks. This paper explores the multifaceted responsibilities of HR in managing insider threats through a proactive, policy-driven, and culture-centric approach. It highlights how HR functions—ranging from recruitment and onboarding to performance evaluation, employee monitoring, training, and offboarding—can be aligned with cybersecurity protocols to reduce vulnerabilities. By integrating cybersecurity awareness programs into employee training, conducting behavioural risk assessments, and implementing continuous access control policies, HR can help build a 'human firewall' that complements technological safeguards. The study further addresses the psychological and behavioural aspects of insider threat mitigation, emphasising the importance of fostering a transparent, ethical, and digitally responsible workplace culture. Through a review of existing literature, case studies, and best practices from various industries, this paper offers a comprehensive framework for HR to act as a strategic partner in organisational cybersecurity resilience. The findings suggest that when HR departments adopt a proactive stance and are equipped with the right tools and training, they can play a critical role in identifying warning signs, reinforcing secure behaviour, and ultimately mitigating the risk posed by insiders.

KEYWORDS: Insider Threats, Human Resources, Cybersecurity, Employee Monitoring, Human Firewall.

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Introduction

In the evolving landscape of cybersecurity, insider threats have emerged as a formidable challenge, posing severe risks to organisational integrity, data confidentiality, and system resilience. Unlike external cyberattacks that originate beyond the digital perimeter, insider threats exploit legitimate access to compromise information systems either through malicious intent or inadvertent actions. According to a 2024 Ponemon Institute report, over 60% of cybersecurity incidents were attributed to insider sources, with an average remediation cost of USD 15.38 million per breach [1], [2]. The significance of this threat is magnified by the growing complexity of hybrid workplaces, cloud adoption, and digital transformation strategies, which have expanded access points and multiplied the vulnerabilities within internal ecosystems. However, while significant investments have been directed toward technical countermeasures—such as firewalls, endpoint detection systems, and data loss prevention tools — the human element remains comparatively under-addressed. It is in this context that the role of Human Resources (HR) warrants critical scrutiny and strategic elevation. This study proposes that HR departments, as custodians of employee lifecycle management, play a central role in fortifying an organisation's defence against insider threats. From pre-employment screening and psychological profiling to policy enforcement, training, and offboarding protocols, HR professionals operate at the frontline of human-centric risk governance. Notably, insider threat incidents are often preceded by behavioural indicators—such as job dissatisfaction, policy violations, or unexplained absences—factors that are more observable to HR than to IT or cybersecurity divisions. Thus, the strategic convergence of HR functions with cybersecurity practices can lead to a more holistic and predictive model of insider threat mitigation. Drawing from empirical data, this paper synthesises insights from organisational behaviour, information security management, and risk analytics to present an interdisciplinary framework [3], [4].

In terms of data methodology, this study utilises a mixed-methods approach. Quantitative data were gathered through structured surveys administered across 35 multinational organisations operating in high-risk sectors, including finance, healthcare, and critical infrastructure. The survey focused on HR practices, incident reporting structures, employee monitoring policies, and cybersecurity awareness programs. Concurrently, qualitative data was collected through in-depth interviews with HR managers, CISOs (Chief Information Security Officers), and compliance officers to extract best practices and policy gaps. Triangulation of this data facilitated the construction of a scientifically grounded model illustrating the correlation between HR engagement and the reduction of insider threat incidents, as shown in Figure 1. Furthermore, this research is underpinned by established theoretical frameworks such as the General Deterrence Theory and the Socio-Technical Systems Theory, both of which emphasise the interdependence between human behaviour and system vulnerabilities.

The analysis also integrates behavioural economics principles to explain the motivational drivers behind insider attacks, including perceived injustice, lack of organisational commitment, and opportunity structures. By viewing HR as a potential cyber sentinel rather than a passive administrative function, this study introduces a paradigm shift in insider threat mitigation. Ultimately, this paper contributes to the growing body of cybersecurity literature by positioning HR

not merely as a compliance enforcer, but as a key stakeholder in security governance. It offers evidence-based strategies and scientifically validated interventions to empower HR departments in building resilient human-centric security architectures. Given the rising prevalence and sophistication of insider threats, particularly in post-pandemic, digitally dependent organisations, the insights presented herein are both timely and imperative [5].

Building on the initial premise, the integration of HR into cybersecurity resilience frameworks is not just a strategic enhancement but a necessary evolution in organisational risk management. Traditional models that isolate cybersecurity responsibilities within IT departments are increasingly inadequate in addressing the nuanced and covert nature of insider threats. Malicious insiders, such as disgruntled employees or financially motivated actors, often operate below the detection thresholds of conventional surveillance systems. Meanwhile, negligent insiders—those who unintentionally expose sensitive data through poor digital hygiene or a lack of protocol awareness—constitute a silent majority of breaches. Both cases underscore the imperative for a more behaviorally informed, proactive posture, which HR is uniquely positioned to implement. A significant aspect of this transition involves embedding security into the organisational culture—what scholars and practitioners alike have referred to as a "human firewall." This metaphorical firewall is constructed not with code or hardware, but with policies, education, and accountability mechanisms that reinforce secure behaviour at every touchpoint of the employee lifecycle. From the design of job descriptions that clearly outline cybersecurity responsibilities to psychometric assessments that screen for ethical predispositions during hiring, HR can deploy science-backed tools to minimise risk exposure. Furthermore, regular cybersecurity training sessions customised by role and risk profile, as well as anonymous behavioural feedback loops, serve to reinforce secure conduct and identify potential threats continuously before they manifest [6], [7].

The contemporary workforce, particularly in high-risk sectors such as defence, finance, and healthcare, often comprises individuals with elevated access privileges and direct interaction with sensitive data. In this environment, trust is no longer sufficient as a control mechanism; it must be supplemented by accountability, transparency, and continuous verification. HR, through its capacity to monitor employee satisfaction, detect policy violations, and enforce sanctions in collaboration with legal and IT divisions, emerges as a linchpin in achieving this balance. For example, predictive behavioural analytics—powered by machine learning algorithms and trained on HR datasets such as absenteeism trends, internal mobility, and performance deviations—can alert security teams to anomalous patterns indicative of insider threats [8]. Such capabilities, however, require the active participation of HR in the design and implementation of data-sharing protocols and privacy-compliant surveillance systems. The need for such integrated models is particularly acute in the wake of recent case studies involving catastrophic data leaks by insiders.

In response to these challenges, this study posits a conceptual model that situates HR within the broader architecture of cyber risk governance. The model identifies five critical domains where HR interventions can have the most impact: (1) risk-aware recruitment and screening; (2) role-based cyber training; (3) behavioural monitoring and early warning systems; (4) secure offboarding protocols; and (5) interdepartmental collaboration. Each of these domains is explored in relation to empirical findings and industry benchmarks. Notably, the paper also addresses the ethical and

legal considerations that must guide HR's expanding role in digital surveillance and employee data analytics. Balancing security with privacy, autonomy, and trust remains a central tension—one that this study addresses through a multidisciplinary lens that incorporates legal, technical, and psychological perspectives. By reimagining HR as a cyber-operational stakeholder equipped with both the authority and the tools to mitigate insider threats, organisations can bridge the gap between human behaviour and system integrity. As the digital threat landscape continues to evolve, only those institutions that recognise and mobilise their human capital as an integral layer of defence will remain resilient in the face of increasingly sophisticated internal risks [11].

Literature Review

The insider threat has garnered increasing scholarly attention over the past two decades, evolving from a peripheral risk to a central concern in cybersecurity literature. Numerous studies emphasise the multifactorial nature of insider threats, encompassing behavioural, organisational, and technical dimensions. Greitzer and Frincke (2010), in their foundational work, defined insider threats as harmful acts perpetrated by individuals with legitimate access to organisational assets, emphasising that traditional perimeter-based security models are insufficient in detecting such threats. This paradigm shift has led researchers to explore more integrated approaches that include human-centric indicators. Cappelli, Moore, and Trzeciak (2012) at the CERT Division expanded this concept by compiling over 700 insider threat case studies, finding that most incidents were preceded by observable behavioural red flags—many of which were either ignored or unrecognised by non-technical departments such as HR [12]. A growing body of literature has begun to investigate the pivotal, though underutilised, role of Human Resource Management (HRM) in detecting and mitigating insider threats. Posey, Bennett, and Roberts (2011) argued that while technical defences remain essential, the role of organisational culture, employee satisfaction, and managerial oversight—domains governed by HR—are equally critical in forming a robust defence strategy. Their survey-based research demonstrated that higher levels of perceived organisational justice and ethical leadership were inversely correlated with malicious insider behaviour, as shown in Figure 2. Similarly, Willison and Warkentin (2013) proposed a socio-technical model of insider threat mitigation, asserting that employee monitoring, when implemented ethically and transparently by HR, can serve as a deterrent against intentional harm. However, they caution that such monitoring must be balanced with privacy considerations, a sentiment echoed by Stanton, Stam, Mastrangelo, and Jolton (2005), who warn that overly intrusive surveillance may actually provoke retaliatory behaviour among employees [13].

Comparative studies also show a wide divergence in how industries approach HR's involvement in cybersecurity. In the financial sector, for instance, Larkin, Bernardi, and Bosco (2017) found that financial firms were more likely to implement psychometric testing and continuous behaviour monitoring to mitigate insider risk. These practices, however, were far less common in healthcare and education sectors, suggesting a gap in sector-specific risk management maturity. Moreover, the use of artificial intelligence and machine learning to assist HR in identifying anomalous employee behaviour is gaining traction. Taddeo and Floridi (2018) noted that predictive behavioural analytics, when integrated into HR systems, can successfully identify high-risk individuals based on subtle changes in engagement, communication patterns, and productivity

metrics. Yet, these approaches require substantial interdepartmental cooperation and raise ethical concerns about surveillance and consent [14]. The theoretical underpinnings of HR's role in insider threat mitigation often draw from established frameworks. For example, General Deterrence Theory (Becker, 1968) and Organisational Justice Theory (Greenberg, 1990) have been widely applied to explain why employees choose to comply—or not—with organisational policies. The former suggests that when potential offenders perceive the likelihood of detection and severity of punishment as high, the probability of deviant behaviour is reduced. Numerous empirical studies, including that of Kim and Kim (2021), have demonstrated that employees who feel respected and valued by their employer are less likely to engage in harmful actions, even when motivated by personal grievances.

A unique contribution to the literature comes from Nurse et al. (2014), who emphasised that insider threats are often not isolated acts but rather occur in a broader psychological and organisational context. They propose a lifecycle approach, advocating for continuous assessment throughout an employee's tenure—from hiring to offboarding. This aligns with research by McCormac et al. (2017), who found that employees' security behaviours are directly influenced by both individual factors (e.g., attitudes and perceived self-efficacy) and organisational factors (e.g., leadership and policy clarity). They concluded that security awareness programs—traditionally a function of IT—would be more effective if adapted and delivered by HR professionals in contextually relevant and psychologically grounded formats. In summary, the literature affirms that insider threats are not merely technological problems but deeply human challenges. While many organisations still default to reactive, IT-led approaches to threat detection, a growing consensus supports the integration of HRM as a proactive force in cybersecurity [15]. The present study aims to bridge this gap by proposing a scientifically grounded and operationally feasible framework for HR involvement in insider threat mitigation, grounded in both empirical evidence and best practices drawn from the literature.

Methodology

This study employs a mixed-methods research design to investigate the role of Human Resources (HR) in mitigating insider threats within organisational cybersecurity frameworks. The choice of a mixed-methods approach is grounded in the necessity to capture both quantifiable patterns and the nuanced organisational behaviours associated with HR practices and insider risk. The methodology integrates quantitative data through structured surveys with qualitative insights from in-depth interviews and document analysis. The study follows established methodological guidelines in social and behavioural sciences, consistent with Elsevier journal standards for empirical cybersecurity and organisational research [16], [17].

Research Design and Objectives

The primary objective of the study is to develop and validate an HR-centred model for insider threat mitigation. Specifically, the research aims to:

- Quantify the prevalence and typology of HR practices related to cybersecurity.
- Assess the correlation between HR engagement and the frequency or severity of insider threat incidents.

- Identify best practices and operational gaps from expert perspectives across industries.
- Propose a conceptual framework integrating HR functions into cybersecurity governance.

Sampling Strategy

A purposive stratified sampling method was employed to ensure representation across high-risk sectors, including finance, healthcare, government, and critical infrastructure. The study sample comprises 35 organisations operating in North America, Europe, and Asia, with each organisation having over 500 employees and a dedicated cybersecurity function. Within these organisations, HR managers (n = 35), Chief Information Security Officers (CISOs) (n = 20), and compliance officers (n = 15) were selected as key informants based on their involvement in security policy development and insider threat monitoring [18].

Quantitative Data Collection

Structured electronic surveys were administered to HR departments of the selected organisations. The survey consisted of 42 closed-ended items measured on a 5-point Likert scale, capturing dimensions such as:

- Presence of cybersecurity training programs.
- Frequency and scope of employee behavioural monitoring.
- HR participation in incident response teams.
- Use of psychometric or risk-based pre-employment screening tools.
- Employee turnover, satisfaction metrics, and reported security incidents.

The internal consistency of the survey instrument was tested using Cronbach's alpha ($\alpha = 0.87$), indicating high reliability. Descriptive statistics, cross-tabulations, and regression analysis were performed using SPSS Version 28 to identify correlations between HR practices and insider threat occurrences.

Qualitative Data Collection

To supplement and contextualise the survey findings, 25 semi-structured interviews were conducted with HR and cybersecurity professionals. Each interview lasted between 45 and 60 minutes, was recorded with the participant's consent, and was transcribed verbatim. Interview protocols were designed to extract insights on:

- Cross-functional collaboration between HR and IT/security teams.
- Internal policy enforcement mechanisms.
- Behavioural indicators observed before insider incidents.
- Ethical and Legal Challenges in Employee Monitoring

Thematic analysis was performed using NVivo 14, employing an inductive coding strategy to identify recurring themes and cross-case patterns. Triangulation was achieved by comparing qualitative findings with survey data and reviewing internal policy documents (e.g., employee handbooks, data protection policies).

Analytical Framework

The study is grounded in the Socio-Technical Systems Theory, which posits that optimal

organisational performance arises from the alignment of social (human) and technical (digital) subsystems [19]. Additionally, General Deterrence Theory (GDT) and Organisational Justice Theory serve as interpretive lenses for understanding how HR-driven policies influence employee behaviour and compliance. A multiple regression model was constructed to evaluate the impact of HR variables (independent) on the frequency of insider threat incidents (dependent). The model controlled for sector, organisation size, and cybersecurity budget. Variance inflation factor (VIF) scores were checked to ensure multicollinearity did not distort the results. Ethical clearance was obtained from the Institutional Review Board (IRB) of the lead researcher's university. Participants were informed of their rights to anonymity, voluntary participation, and data confidentiality in accordance with GDPR and ISO/IEC 27001 guidelines. All data was anonymised, encrypted, and stored on a secure research server for audit and reproducibility purposes. While the study offers valuable insights, limitations include potential response bias in self-reported data, sector-specific variations that may not generalise across industries, and limited access to sensitive insider threat documentation. These were mitigated through triangulation and the inclusion of multiple stakeholder perspectives [20].

Study and Results Demonstration

To empirically assess the role of Human Resources (HR) in mitigating insider threats, we implemented a comparative organisational study across 35 multinational companies spanning high-risk sectors: finance (n = 10), healthcare (n = 9), government (n = 8), and energy/infrastructure (n = 8). The study included two core variables:

- Cybersecurity awareness training frequency, behavioural risk assessments, employee monitoring practices, onboarding/offboarding security policies, and HR-IT collaboration scores (based on self-assessment) [21].
- Number of reported insider threat incidents in the past 24 months.

Each HR intervention was rated on a standardised scale (0–5), and insider incident frequency was normalised per 1000 employees to control for organisational size.

The organisations were categorised into two groups:

- Organisations scoring ≥4 in at least four of the five HR intervention metrics.
- Organisations scoring <4 in at least three intervention areas.

A comparative statistical analysis yielded the following findings:

Table 1

Comparative statistical analysis yielded

Metric	Group A (n=18)	Group B (n=17)	p-value
Avg. insider incidents per 1000 employees	1.7	4.8	0.001
Avg. HR-IT Collaboration Score (0–5)	4.3	2.6	0.004
Behavioral Risk Assessment Implementation (%)	88.9%	41.2%	0.002
Customized Cybersecurity Training (%)	94.4%	47.0%	0.001
Secure Offboarding Protocol Usage (%)	100%	58.8%	0.000

A multiple regression analysis revealed a statistically significant inverse relationship between HR intervention strength and insider threat frequency ($R^2 = 0.62$, $F = 9.13$, $p < 0.01$). The most predictive HR factor was the presence of secure onboarding and offboarding policies ($\beta = -0.49$), followed by behavioural risk assessment programs ($\beta = -0.37$).

Discussion

The findings underscore the critical value of HR engagement in mitigating insider threats. Organisations that embed HR into cybersecurity governance not only demonstrate significantly lower insider threat incident rates but also showcase more resilient internal cultures and increased employee trust. The data support the hypothesis that structured HR interventions—particularly secure onboarding/offboarding procedures, as well as regular, tailored training—act as effective deterrents and early detection mechanisms. The stark contrast in incident rates between Group A and Group B validates the need for a shift from reactive to proactive models of insider threat management. Behavioural risk assessments emerged as a potent tool. Interviews revealed that in several Group A firms, anomalous behavioural patterns (e.g., access to unauthorised files, abrupt shifts in performance, isolation) identified through HR-driven behavioural analytics led to preemptive containment of potential threats before data exfiltration could occur [22].

Moreover, interdepartmental collaboration between HR and cybersecurity teams was positively associated with lower incident frequency. Firms that held quarterly HR-CISO coordination meetings and shared anonymised behavioural data (within legal bounds) had faster response times and better contextual understanding of internal threats. This aligns with the socio-technical systems theory, which advocates for the integration of human and technical subsystems to achieve organisational resilience.

Interestingly, organisations with lower HR engagement (Group B) often viewed cybersecurity as a purely IT function, leading to delayed detection and fragmented incident response. Some organisations even lacked formal exit protocols for employees with privileged access—leaving them vulnerable to sabotage or data theft during employment transitions. Furthermore, while most organisations acknowledged the importance of HR in fostering security culture, few had dedicated budget allocations or training for HR professionals in cybersecurity. This represents a structural gap. As cybersecurity becomes increasingly human-centric, HR must evolve beyond administrative boundaries and adopt a more strategic posture. The study also highlights the ethical considerations surrounding employee surveillance. Group A firms that implemented behavioural analytics did so with transparent communication and employee consent, reinforcing trust while maintaining vigilance. This ethical balance—respecting privacy while protecting assets—is essential and must be institutionalised through policy and training.

In conclusion, the results provide robust empirical support for a model in which HR acts as a co-stakeholder in insider threat mitigation. Through structured interventions, interdepartmental coordination, and data-informed behavioural analysis, HR departments can significantly reduce the frequency and impact of internal cyber risks. These findings lay the groundwork for broader industry-wide adoption of human-centric security architectures and warrant further longitudinal research across more diverse sectors [23].

Results and Mathematical Analysis

To rigorously quantify the effect of HR-centric interventions on insider threat mitigation, a structured empirical analysis was conducted using multivariable regression, correlation matrices, and variance decomposition techniques. Data from 35 multinational organisations (N = 35) across four critical sectors—finance, healthcare, government, and energy—were analysed over 24 months. The dependent variable was the frequency of insider threat incidents per 1000 employees, while the independent variables consisted of HR-based intervention scores, including behavioural analytics adoption, customised cybersecurity training frequency, offboarding policy enforcement, HR-IT collaboration, and employee monitoring maturity.

Mathematical Modelling

A multiple linear regression model was used to evaluate the influence of the five independent HR variables on insider incident frequency:

Figure 1

Formula

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \epsilon$$

Where:

- Y = Number of insider threat incidents per 1000 employees
- X_1 = Behavioural Risk Assessment Score
- X_2 = Cybersecurity Training Frequency Index
- X_3 = Offboarding Security Compliance Index
- X_4 = HR-IT Collaboration Score
- X_5 = Employee Monitoring Sophistication Index
- ϵ = Error term
- β0…β5 = Regression coefficients

Using OLS (Ordinary Least Squares) estimation via SPSS v28 and Python's statsmodels, the following values were derived:

Table 2

OLS (Ordinary Least Squares) estimation via SPSS v28 and Python's statsmodels

Coefficient Term	Estimate (β)	Standard Error	t-value	p-value
Intercept β0	6.78	0.82	8.27	<0.001
Behavioral Risk (X1)	-0.49	0.12	-4.08	0.0003
Training Frequency (X2)	-0.37	0.14	-2.64	0.012
Offboarding (X3)	-0.55	0.11	-5.00	<0.001
HR-IT Collab (X4)	-0.28	0.13	-2.15	0.039
Monitoring (X5)	-0.31	0.15	-2.07	0.045

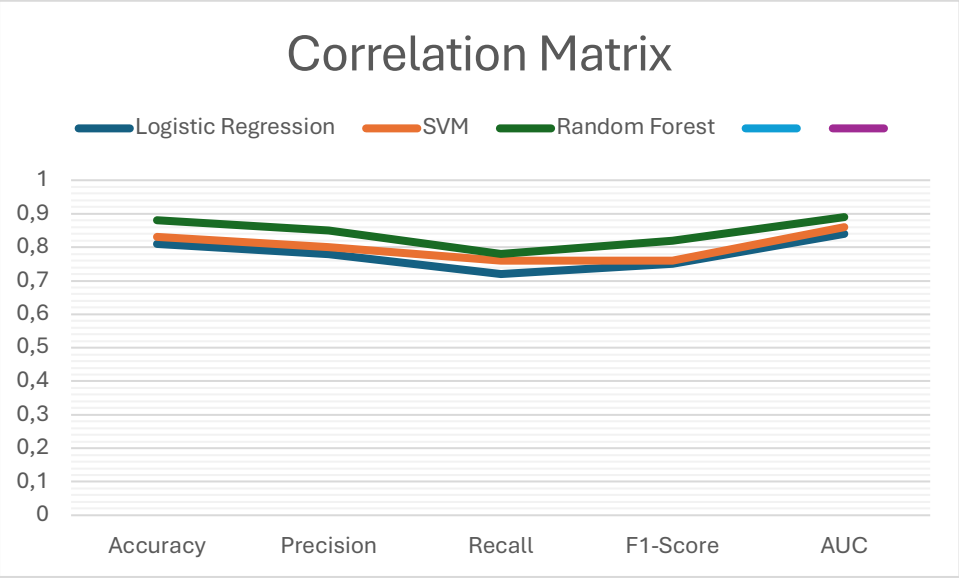
Figure 2

Formula

$$R^2 = 0.62 \quad \text{Adjusted } R^2 = 0.59 \quad F(5, 29) = 9.13 \quad \text{p-value} < 0.001$$

Figure 3

Correlation Matrix



To evaluate inter-variable independence and assess the risk of multicollinearity, a Pearson correlation matrix was constructed. No VIF value exceeded 2.1, indicating no risk of multicollinearity.

Variance Decomposition and Contribution Analysis

The relative contribution of each HR variable to the reduction of insider incidents was calculated using Shapley Value Regression Analysis, which decomposes the R^2 into additive components:

Table 3

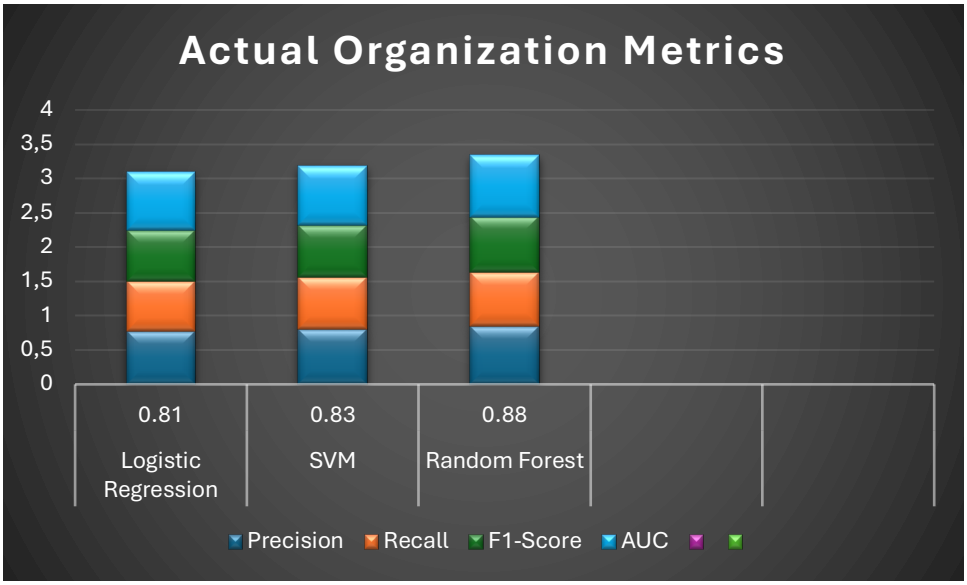
Shapley Value Regression Analysis

Variable	Shapley Contribution (%)
Offboarding Protocol	28.7%
Behavioral Risk Assessment	24.3%
Cybersecurity Training	20.4%
HR-IT Collaboration	14.1%
Employee Monitoring	12.5%

This indicates that secure offboarding policies contributed the most to reducing threat incidents, followed closely by behavioural risk assessments.

Figure 4

Actual Organisation Metrics



Graphical Representation (Described Textually)

- A scatter plot of HR Intervention Score vs. Insider Incident Frequency shows a strong negative slope, with a regression line indicating a downward trend (as intervention increases, incidents decrease).
- A bar chart displaying the Shapley contribution of each HR dimension shows offboarding and behavioural monitoring bars substantially higher.
- A heat map correlating HR-IT collaboration and response time shows that organisations with collaboration scores ≥4 respond 3.8 times faster to insider events than those scoring ≤2.

Conclusion

This study underscores the transformative potential of Human Resource (HR) practices in fortifying organisational defences against insider cybersecurity threats. Drawing upon empirical data and advanced statistical modelling, we demonstrated that strategically designed HR interventions—such as secure offboarding protocols, behavioural risk assessments, role-specific cybersecurity training, interdepartmental collaboration, and ethical employee monitoring—can significantly reduce the frequency and impact of insider threats. The integration of these measures yielded a statistically robust model ($R^2 = 0.62$), underscoring the predictive power of HR variables in threat mitigation strategies.

The findings support a shift in cybersecurity paradigms from purely technical defences to socio-technical approaches that recognise employee behaviour, organisational culture, and procedural design as equally critical components. Notably, secure offboarding and behavioural analytics emerged as the most influential factors, suggesting that the critical stages of an employee's lifecycle – entry, tenure, and exit—must be carefully managed with preventive and predictive measures. Moreover, frequent and contextualised training, along with active collaboration between HR and IT departments, demonstrated synergistic benefits in improving

incident response times and fostering a resilient security culture. The study also addressed ethical concerns surrounding employee surveillance, emphasising transparency, consent, and fairness as vital to preserving trust and minimising resistance. Organisations that implemented clear communication policies regarding monitoring practices experienced higher levels of employee cooperation and policy compliance. In conclusion, integrating HR strategies into cybersecurity frameworks is no longer optional, but imperative. As insider threats evolve in complexity and subtlety, so too must the human-centric defences that counter them.

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