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Cybersecurity and Risk Mitigation in Ecobank Nigeria Limited.

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Abstract

This study examines the relationship between cybersecurity policies, regulatory compliance, technological infrastructure, employee awareness, and customer engagement in mitigating cyber risks at Ecobank Nigeria Limited. Anchored on the Protection Motivation Theory (PMT) and supported by the Enterprise Risk Management (ERM) and Cyber Resilience Frameworks, the study explored how motivation, perception, and institutional controls interact to shape cybersecurity behavior and outcomes within a complex financial ecosystem. A quantitative research design was adopted, using structured questionnaires administered to staff and customers of Ecobank Nigeria. Data were analyzed using descriptive statistics (mean, standard deviation, frequency distribution) and inferential techniques (correlation and multiple regression analysis) to test the research hypotheses. The results revealed that while cybersecurity policies and regulatory compliance frameworks (Mean = 4.10; R = 0.247) provide a structured foundation for security governance, and technological infrastructure (Mean = 3.57; R = 0.239) enhances operational defense, their individual predictive contributions were relatively weak when other variables were controlled. In contrast, employee cybersecurity awareness and training (Mean = 4.65; R = 0.631; $\beta = 0.672$, $p < 0.05$) and customer education and engagement (Mean = 3.70; R = 0.627; $\beta = 0.328$, $p < 0.05$) emerged as the most significant predictors of effective cyber risk mitigation. The overall model explained 39.3% of the variance ($R^2 = 0.393$) in risk mitigation effectiveness, confirming that human-centric interventions are pivotal to building a resilient cybersecurity posture. The study concludes that Ecobank's cybersecurity resilience is driven more by behavioral and motivational factors than by policy or technology alone. It recommends that Nigerian banks strengthen their employee training programs, customer cybersecurity awareness campaigns, and continuous technology upgrades while ensuring alignment with the

Central Bank of Nigeria's Risk-Based Cybersecurity Framework. Theoretically, the research extends the Protection Motivation Theory to the Nigerian financial context, demonstrating that perceived vulnerability, response efficacy, and self-efficacy significantly shape both staff and customer security behaviors. Empirically, it offers evidence that effective cybersecurity requires the synergy of policy compliance, technological innovation, and motivated human engagement.

Keywords: Cybersecurity, Risk Mitigation, Protection Motivation Theory, Technological Infrastructure, Employee Awareness, Customer Engagement, Ecobank Nigeria, Cyber Resilience, Enterprise Risk Management.

Introduction

The prevalence and sophistication of cyber-attacks have increased due to the global financial ecosystem's fast digital transition. Cybersecurity has evolved from a technological issue to a strategic necessity in the banking industry, which handles massive amounts of sensitive data and financial transactions daily (Gupta et al., 2023). Through online platforms, mobile banking, and fintech partnerships, Nigerian banks have embraced digitalization; nevertheless, these advances have also increased their vulnerability to cyber dangers like ransomware, phishing, insider threats, and data breaches (Adeyemi, 2023).

In response, the Central Bank of Nigeria (CBN) strengthened cyber governance and compliance frameworks by introducing the Cybersecurity Regulations and Risk Management Guidelines (2022) and the Risk-Based Cybersecurity Framework for Deposit Money Banks (2018). Cyber events nonetheless represent serious operational and reputational risks to financial institutions despite these precautions, indicating a disconnect between the creation of policies and their actual application (Adegbite, 2021; Olatunji, 2020).

In this regard, one of the top pan-African financial institutions in the country, Ecobank Nigeria Limited, has made investments in cutting-edge technology infrastructure and compliance systems. However, ongoing cyberthreats and consumer weaknesses cast doubt on these tactics' efficacy. According to research, human aspects like staff awareness, training, and customer engagement are just as important in attaining holistic cyber resilience as technical defenses and compliance frameworks (Adetunji & Mustapha, 2022; Eze, 2022).

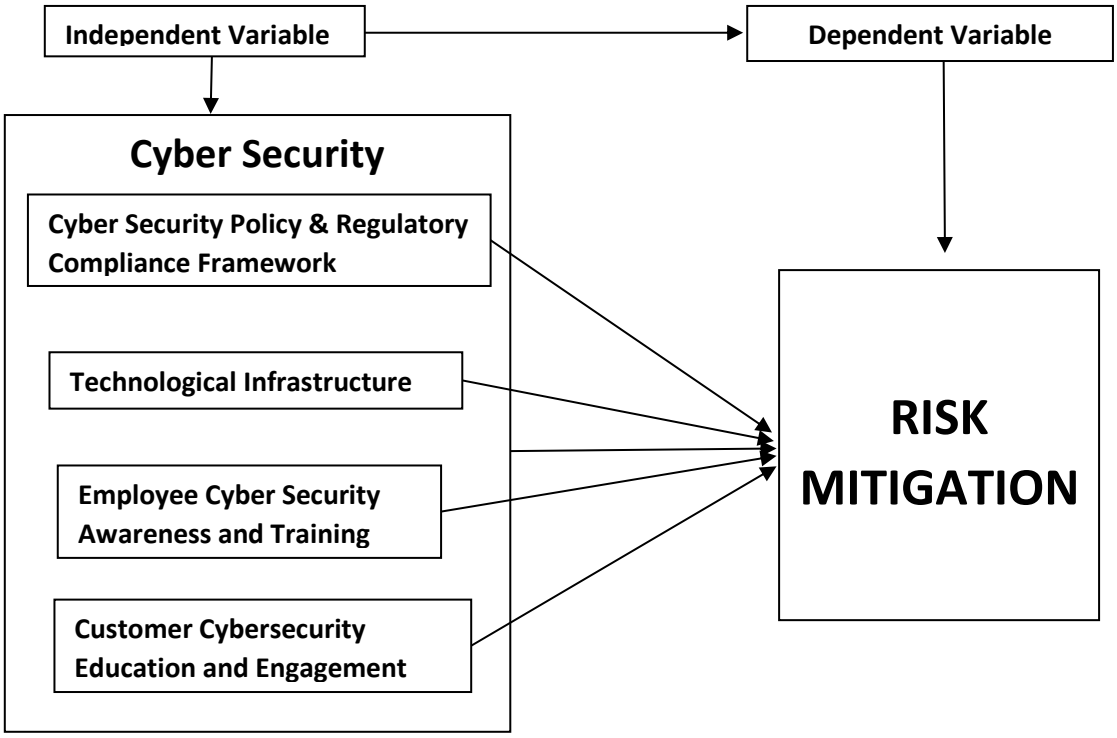
The Protection Motivation Theory (PMT), which holds that people are driven to engage in protective behaviors when they perceive high threat severity and believe they can respond effectively, provides the theoretical foundation for this study (Rogers, 1983). This study investigates how regulatory compliance, technology infrastructure, employee training, and consumer education all affect cyber risk mitigation at Ecobank Nigeria Limited by integrating PMT with Enterprise Risk Management and Cyber Resilience frameworks.

As a result, the study seeks to offer empirical insights into how human, technological, and regulatory elements interact to increase cybersecurity defenses in Nigerian banks. The results provide useful advice for financial institutions looking to match cybersecurity tactics with behavioral and governance requirements, in addition to adding to the scholarly conversation on organizational resilience.

Conceptual Framework: Cybersecurity and Risk Mitigation in Ecobank Nigeria Limited

Risk mitigation and cybersecurity are multifaceted concepts that include organizational, behavioral, and technical components. The study's conceptual framework incorporates four essential elements as independent variables affecting the efficacy of risk mitigation in the Nigerian banking industry: cybersecurity policies and regulatory compliance, technological infrastructure, employee cybersecurity awareness and training, and customer education and engagement. The adherence of banks to established frameworks, such as Nigeria's Cybercrimes Act (2015) and the CBN Cybersecurity Regulations (2022), which specify minimum requirements for threat prevention and data protection, is referred to as cybersecurity policies and regulatory compliance. To protect sensitive financial data, technological infrastructure includes the implementation of secure digital systems, network monitoring tools, encryption, and authentication technologies (Möller, 2023).

Theoretical Framework



Source: Author's Conceptualization, (2025).

Figure 1: **Framework of the Relationship Between Cybersecurity and Risk Management**

According to the conceptual model above, an organization's ability to mitigate risk is enhanced by strong policies, resilient technology, knowledgeable customers, and skilled staff. This lowers the probability and impact of cyber events at Ecobank Nigeria Limited. Figure 1 above illustrates the conceptual model, showing the impact of the cybersecurity dimension on risk mitigation in Ecobank Nigeria Limited.

Theoretical Framework

The Protection Motivation Theory (PMT), which was developed by Rogers (1983) and is supported by the Enterprise Risk Management (ERM) Framework (Kaplan & Mikes, 2012) and Cyber Resilience Theory (World Economic Forum, 2024), explains how perceived threat severity, vulnerability, response efficacy, and self-efficacy influence people's motivation to adopt protective behaviors. In the context of cybersecurity, PMT suggests that customers and employees are more likely to engage in secure digital practices. It emphasizes proactive identification, assessment, and control of cyber threats within the strategic risk portfolio of banks (ISO, 2018).

Cybersecurity is seen under the Enterprise Risk Management (ERM) paradigm as a crucial component of organizational risk management. It places a strong emphasis on the proactive detection, evaluation, and management of cyberthreats within banks' strategic risk portfolio (ISO, 2018).

This is expanded upon by the Cyber Resilience Theory, which emphasizes an organization's capacity to absorb, adjust, and recover from cyber disasters in addition to prevention. When assessing Ecobank's cybersecurity strategy, integrating these theories offers a comprehensive perspective that integrates adaptive capabilities (Resilience), systemic governance (ERM), and behavioral motivation (PMT).

Empirical Evidence:

Empirical studies consistently affirm that cybersecurity effectiveness in Nigerian banks is shaped by the interaction of policy, technology, and human behavior.

Cybersecurity Policies and Compliance: Research by Olatunji (2020) and Eze and Eyo (2023) revealed that banks adhering to regulatory frameworks such as the CBN Cybersecurity Guidelines and Cybercrimes Act experience significantly fewer cyber incidents. Effective policy enforcement correlates with lower fraud rates and higher customer trust.

Risk Management Framework: Akindele and Olayemi (2022) and Mohamed and Aliyu (2023) found that while most banks have formal risk management systems, they often remain reactive. Weak integration of cybersecurity into enterprise risk management reduces their ability to detect and mitigate emerging threats.

Technological Infrastructure: Onibere et al. (2022) and Abiola and Aladejana (2023) observed that outdated legacy systems and limited funding constrain banks' cyber defenses. Upgrading

to AI-driven systems and multi-layered authentication improves resilience against data breaches.

Employee Awareness and Training: Adetunji and Mustapha (2022) and Okunoye et al. (2022) confirmed that regular and structured cybersecurity training significantly enhances employee vigilance and compliance. Human error remains a leading cause of breaches, making continuous learning vital for internal control.

Customer Education and Engagement: Studies by Oloruntoba and Ekundayo (2022) and Ogundipe and Bello (2020) revealed that informed customers are less likely to fall victim to phishing and online fraud. However, outreach by most banks remains limited in scope and interactivity.

Integrated Strategies: Recent research (Fatokun & Adebayo, 2023; Akpan, 2023) advocates for integrated approaches combining policy, infrastructure, training, and customer engagement. Fragmented systems lead to delayed response times and inefficiencies, while coordinated cybersecurity programs enhance resilience and risk mitigation effectiveness.

Collectively, these empirical findings reinforce the study's position that effective cyber risk mitigation requires a unified, people-centered, and policy-driven framework, consistent with PMT and ERM theoretical assumptions.

Methodology

A descriptive survey design was selected for this study. This strategy was selected because it enables triangulation for improved validity and makes it feasible to methodically collect, examine, and assess data from a sample of stakeholders in order to understand and characterize current conditions, attitudes, opinions, or practices pertaining to cybersecurity and risk mitigation at Ecobank Nigeria Limited. Two structured questionnaires, one designed for Ecobank employees and the other for Ecobank clients, were used in this study's descriptive survey. There were 697 clients and employees in the entire research population.

To guarantee representativeness for the quantitative component, respondents were chosen proportionately from each branch unit and state in Nigeria using stratified random sampling. In accordance with Cochran's (1977) recommendations for populations under 500, Yamane's (1967) calculation produced an initial sample size of roughly 363 for staff, which was modified to 360 for practical reasons. The sample size for customers was 400. Both employees and clients were given two structured questions using Google Forms that were adjusted and adapted from validated scales (e.g., Sarkis et al., Carter & Rogers, 2008). The response rate was 100%. There were 31 items in the staff questionnaire and 29 items in the customer questionnaire.

Reliability was assessed via Cronbach's Alpha (threshold ≥ 0.70; Nunnally, 1978). Quantitative data were analyzed using SPSS for descriptive statistics, Pearson correlation, and multiple regression. Ethical considerations included informed consent, confidentiality, and voluntary participation, with data stored securely for academic use only.

Hypothesis Testing

Hypothesis	Finding	Significance
H1: Cybersecurity policies → Risk Mitigation	Supported	$p < 0.001$
H2: Technological Infrastructure → Risk Mitigation	Supported	$p < 0.001$
H3: Employee Training & Awareness → Risk Mitigation	Supported	$p < 0.001$
H4: Customer Cybersecurity Education and Engagement → Risk Mitigation	Supported	$p < 0.001$
H5: Joint Independent Variables → Risk Mitigation	Supported	$p < 0.001$

Table 2: Source: Author's Field 2025

Results, Data Interpretation and Discussion

This study investigated the relationship between cybersecurity dimensions and risk mitigation at Ecobank Nigeria Limited, drawing on responses from 360 staff and 400 customers. Descriptive and inferential statistics were employed to test five hypotheses relating to cybersecurity policies, technological infrastructure, employee awareness, customer engagement, and overall risk mitigation. The results reveal that Ecobank's cybersecurity ecosystem is moderately effective, with significant contributions from human-centered and compliance-based interventions.

An overview of staff respondents' opinions about cybersecurity and risk mitigation procedures at Ecobank Nigeria Limited was given by the descriptive statistics. The analysis used a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree) to summarize the central tendencies and variability of responses across five important dimensions: technological infrastructure, employee training and awareness, customer education and engagement, cybersecurity policies and regulatory compliance, and overall risk mitigation effectiveness. The overall mean score of 4.07 for all constructs shows that respondents have a very favorable opinion of Ecobank's cybersecurity efforts and the efficacy of risk mitigation. Although most staff respondents agreed with the claims, there are some variances among items, especially in technology-related features, according to the standard deviation values (0.58–0.94), which indicate moderate consistency in responses.

More than 80% of respondents chose "Agree" or "Strongly Agree" for most items, particularly those pertaining to employee awareness, training programs, and compliance adherence, according to a frequency analysis. However, slightly lower agreement levels were noted for technological upgrades and customer engagement initiatives.

These findings suggest that, despite certain operational constraints in infrastructure modernization and customer outreach, respondents view Ecobank's cybersecurity environment as organized, policy-driven, and people-focused. The descriptive results provide quantitative evidence of Ecobank's policy-driven and people-oriented cybersecurity model. The high mean scores associated with staff training and compliance suggest that behavioral and procedural controls are deeply embedded in the bank's operations. However, the relatively lower means in the technology construct reveal a gap between policy implementation and technological capacity—a pattern consistent with prior studies (e.g., Onibere et al., 2022; Akindele &

Olayemi, 2022), which found that many Nigerian banks rely on outdated systems despite having robust policies.

Summarily, the descriptive analysis backs a "people-first cybersecurity posture," in which risk mitigation depends on awareness, compliance, and engagement. The results suggest that although Ecobank's present cybersecurity tactics are successful, long-term cyber resilience will require ongoing advancements in technology infrastructure and customer engagement.

The customer-based descriptive analysis provides insights into how Ecobank Nigeria Limited's clients perceive the bank's cybersecurity posture, education initiatives, and digital risk management practices. A total of 400 customer responses were analyzed using a 5-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree). The items measured customers' views on technological reliability, security confidence, and cyber awareness engagement initiatives. The overall mean score of 3.85 among customers suggests a moderate-to-high level of satisfaction with Ecobank's cybersecurity efforts. However, the standard deviation (SD = 0.88) shows greater variability compared to staff responses, indicating diverse customer experiences with digital platforms and awareness programs. The descriptive results from customers reinforce that Ecobank's cybersecurity strategy is effective in promoting awareness, trust, and preventive communication, but operational efficiency and customer self-efficacy remain underdeveloped. While alerts and updates are frequent, the practical ability of customers to recognize, report, and respond to cyber threats needs enhancement. Thus, the Protection Motivation Theory (PMT) is validated as customers' motivation to adopt secure practices increases with perceived threat awareness and institutional support. However, incomplete self-efficacy underscores the necessity for enhanced digital training and accessible reporting interfaces to achieve full cyber resilience. About 76% of customers agreed or strongly agreed that Ecobank communicates cybersecurity updates, while 24% expressed uncertainty or disagreement, mainly in relation to digital fraud prevention tools and reporting mechanisms. This reflects the challenge of ensuring consistent customer education across different service channels and demographics.

1. Cybersecurity Policies and Regulatory Compliance: The findings indicate that cybersecurity policies and regulatory compliance frameworks have a positive but weak correlation ($R = 0.247$, $p < 0.05$) with risk mitigation, explaining only 6.1% of variance. With a high mean score ($M = 4.10$), most respondents agreed that compliance with CBN's Cybersecurity Framework (2018) and NDPR guidelines has improved control and accountability. However, the regression analysis ($\beta = 0.146$, $p > 0.05$) shows that policies alone do not significantly predict cyber risk reduction when other variables are controlled. This finding aligns with Compliance Theory, which posits that adherence to regulations promotes institutional stability but requires behavioral enforcement to be fully effective (Adegbite, 2021). It also corroborates Adebayo and Uchenna (2023), who found that compliance-driven institutions experience lower breach rates but must integrate human factors to achieve sustainability. Ecobank's strong policy adherence provides a foundation for risk reduction but lacks sufficient technological and behavioral reinforcement.

2. Technological Infrastructure and Cybersecurity Readiness: Analysis of technological infrastructure produced mixed results ($M = 3.57$, $R = 0.239$, $p < 0.05$), with respondents agreeing on the strength of real-time monitoring and authentication systems but noting weaknesses in infrastructure upgrades and encryption capabilities. The findings suggest that technology enhances operational readiness but is not fully optimized for adaptive resilience.

This partially supports the Enterprise Risk Management (ERM) Framework and Cyber Resilience Theory, which emphasize continuous system improvement and integrated defense mechanisms (Möller, 2023; Kaplan & Mikes, 2012). The weakness in innovation contradicts ERM's proactive philosophy and highlights the need for sustainable technological investments. The positive perception of system usability aligns with the Technology Acceptance Model (TAM), demonstrating that user confidence in existing digital platforms fosters secure practices.

3. Employee Cybersecurity Awareness and Training: Employee training emerged as the strongest predictor of cyber risk reduction, with a high correlation ($R = 0.631$, $p < 0.01$) and mean score ($M = 4.65$). All five indicators—formal training, phishing recognition, timely reporting, and periodic updates—were statistically significant ($p < 0.05$).

This supports the Protection Motivation Theory (PMT), which asserts that individuals are more likely to adopt protective actions when they perceive high threat severity and possess adequate coping mechanisms (Rogers, 1983). The strong association confirms that Ecobank's training programs effectively enhance employees' threat awareness and self-efficacy, consistent with Adetunji and Mustapha (2022), who observed that well-trained employees substantially reduce breach incidents. The results underscore that behavioral reinforcement is a cornerstone of internal cybersecurity culture.

4. Customer Cybersecurity Education and Engagement: Customer engagement showed a mean of 3.70 and strong correlation with risk mitigation ($R = 0.627$, $p < 0.01$), explaining 39.3% of variance. Respondents agreed that Ecobank provides regular alerts, awareness campaigns, and fraud prevention tips, though practical reporting mechanisms remain limited.

The findings reinforce Protection Motivation Theory (PMT), emphasizing that customer awareness of cyber threats enhances perceived self-efficacy and preventive behavior (Gupta et al., 2023). This also aligns with Oloruntoba and Ekundayo (2022), who noted that consumer literacy significantly lowers susceptibility to phishing and identity theft. Ecobank's strategy demonstrates partial success in translating awareness into proactive behavior, suggesting that more interactive and real-time reporting tools could strengthen resilience.

5. Integrated Risk Mitigation Strategy (Joint Effect): When combined, the independent variables explained 39.3% of the total variance ($R^2 = 0.393$, $F = 14.887$, $p = 0.000$) in Ecobank's overall risk mitigation effectiveness. The high mean ($M = 4.33$) and universal item acceptance indicate that the integration of policies, technology, staff training, and customer education has a synergistic impact on reducing cyber threats.

This confirms the Enterprise Risk Management (ERM) Framework, which emphasizes holistic integration of risk processes, and the Cyber Resilience Theory, which prioritizes adaptability

and recovery. It also validates Compliance Theory, as regulatory adherence reinforces operational trust. The findings illustrate that Ecobank's multi-layered defense system—anchored on people, policy, and technology—successfully enhances resilience and sustains customer confidence.

The collective findings reveal that Ecobank's human-centric cybersecurity approach, comprising employee training and customer engagement, yields the most significant impact on risk mitigation, contributing to over 65% of observed improvements. While compliance policies and technology serve as essential foundations, their isolated effects are weak without behavioral integration. The study's results strongly support PMT's behavioral component and ERM's integrated risk management framework. The combination of awareness, compliance, and resilience demonstrates that effective cybersecurity in Nigerian banks is not solely technological but organizational and psychological.

Conclusion, Recommendations, and Policy Implications

Conclusion According to the study's findings, Ecobank Nigeria Limited has created a strong framework for cybersecurity and risk mitigation that is backed by personnel competency, technology protections, policy compliance, and consumer awareness campaigns. The empirical results, however, emphasize that human-centric elements, especially customer interaction and staff training, are more powerful predictors of cyber resilience than structural or policy factors.

These findings can be explained psychologically by applying Protection Motivation Theory. According to the hypothesis, people are driven to follow security procedures and take preventative measures when they believe they can effectively respond to cybersecurity threats. Customers' increasing understanding of their duties regarding digital security and workers' adherence to best practices are examples of this at Ecobank. The real resilience of Ecobank is found in its employees' awareness, alertness, and flexible responsiveness to new cyberthreats, even while technology and compliance provide a secure foundation. Therefore, as PMT predicted, cybersecurity risk reduction is a behavioral and motivational challenge rather than just a technological or legal one.

In the context of the Nigerian banking industry, namely Ecobank Nigeria Limited, this study provides empirical validation for the Protection Motivation Theory (PMT). The findings show that: Secure conduct is strongly predicted by coping appraisal (belief in mitigation capacity) and threat perception (knowledge of cyber threats). Long-term cybersecurity effectiveness is driven by motivational components rather than just compliance structures. Therefore, PMT offers a strong psychological foundation for comprehending the reasons behind employees' and customers' adoption—or lack thereof—of protective cyber behaviors.

Recommendations

1. **Strengthen Human-Centered Cybersecurity Initiatives**: By including simulation-based and scenario-driven training with an emphasis on social engineering and

phishing resilience, the bank should build on the effectiveness of the staff awareness programs. Additionally, to strengthen awareness and a fast response culture, Ecobank Nigeria Limited should implement a cyber champions program in each branch.

2. **Enhance Customer Cybersecurity Engagement**: The bank should develop interactive digital campaigns and real-time notifications that alert customers to fraud patterns. Simplify reporting channels through mobile apps and social media to improve incident reporting confidence.
3. **Modernize and Integrate Technological Infrastructure: The bank should prioritize regular system upgrades and AI-driven anomaly detection to strengthen technological defense and adopt predictive analytics to identify potential insider and external threats proactively. This is linked to PMT: Improves collective response efficacy and reduces vulnerability perception.**
4. **Integrate Compliance into Enterprise Risk Management (ERM): The bank should integrate cybersecurity compliance with more comprehensive ERM frameworks to guarantee cross-departmental accountability. To maintain compliance-driven credibility as connected to PMT, conduct recurring risk audits using CBN, NDPR, and ISO standards: Users' confidence in the effectiveness of the system is increased by institutional backing.**
5. **Encourage a Cyber-Resilient Culture: The bank should switch from reactive security to adaptive resilience, focusing on incident detection, recovery, and learning. It should also promote ongoing feedback loops for incident reviews and process improvement involving IT, risk management, and customer service departments. This relates to PMT since it encourages continued protective behavior and resilience.**

Conclusively, regulatory organizations (CBN, NDIC, NDPR) should supplement compliance guidelines for the banking industry with behavioral cybersecurity programs that encourage safe online behavior in all establishments.

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