Name of Publisher: BRIGHT EDUCATION RESEARCH SOLUTIONS

Area of Publication: Business, Management and Accounting (miscellaneous)

Let's Start!

Journal of Management & Social Science

ISSN Online: 3006-4848
ISSN Print: 3006-483X

https://rjmss.com/index.php/7/about

RECOGNIZED IN "Y" CATEGORY BY HEC

[EVALUATING THE IMPACT OF FINANCIAL, CYBERSECURITY, AND PERFORMANCE RISKS ON BANKING SECTOR SUSTAINABILITY: EVIDENCE FROM PAKISTAN]

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Review Type: Double Blind Peer Review

Journal of Management & Social Science
VOL-2, ISSUE-1, 2025

ABSTRACT

The sustainability of the banking sector is increasingly influenced by various risks, including financial risk, cybersecurity risk, and performance risk. This study examines the impact of these risks on banking sector sustainability, with a particular focus on the Pakistani context. A quantitative research design is adopted, utilizing a well-structured questionnaire. The sample size consists of 194 participants, including employees and consumers of banks, and responses collected through Google Forms. Convenience sampling is employed, and Smart PLS is used for data analysis. PLS-SEM analysis reveals that financial risk, cybersecurity risk, and performance risk significantly and negatively affect sustainability. These findings enhance the understanding of how risk management techniques encourage the sustainable growth of the banking industry in emerging economies. This study offers insightful information, for policymakers, practitioners, and researchers regarding the impact of these risks on banking sector sustainability. By analyzing these risks collectively, this research identifies key vulnerabilities and proposes risk mitigation strategies to strengthen banking sector stability and resilience. Furthermore, this study contributes to the development of robust regulatory frameworks and promotes financial stability and inclusive economic growth in emerging markets.

Keywords: Financial Risk (FR), Cybersecurity Risk (CR), Performance Risk (PR), Sustainability (SUS), Partial Least Squares, Structural Equation Modeling (PLS-SEM).

Introduction

Sustainability involves attaining stability among monetary growths, environmental quality, social equity and good governance (Elkington, 1999). Sustainable practices are a innovative corporate norms due to societal and constitutional pressure, as well as greater user awareness (Chabowski, Mena and Gonzalez-Padron, 2010; Kotler, 2011). Risks are obstacle to the implementation of sustainable practices as they create uncertainty that constrains commitment to long-term sustainability objectives.

The financial, performance, and cyber risks are becoming more dominant in ensu ring the sustai-nability of the banking sector because they have a direct bearing on operational stability, regulatory compliance, and customer confidence. Financial risk, such as credit risk, liquidity risk, and market volatility, challenges long term economic sustainability by influencing profitability and resilience (Tariq et al., 2020).Performance risk, including operational inefficiencies and governance failure, can erode stakeholder confidence and hinder the sector's capacity to sustain financial growth (Busch et al., 2021). Moreover, cyber risk has become a key issue, with data breaches, Cyberattacks, and digital fraud posing a threat to the integrity and security of financial institutions (PwC, 2022). The growing dependence on digital banking and financial technology also increase vulnerabilities and make a cybersecurity a major driver of sustainability in the banking industry (Kumar et al., 2023).

Financial risk, which is precipitated by factors like loan default, interest rate volatility, and economic instability, can weaken the capacity of a bank to preserve liquidity and profitability, and therefore contribute to systemic

instability (Haq & Heaney, 2012). Banks in emerging economies are confronted with increased financial risks precipitated by market volatility and constrained access to risk-hedging facilities (Waheed & Mathur, 2020). Performance risk is caused by operational inefficiencies, weak governance and mismanagement which not only undermine stakeholder trust but also attract regulatory attention and possible legal repercussions (Beck et al., 2013). At the same time, cyber risk has emerged as a rising issue in digital banking, as Cyberattacks, ransom ware attacks, and data breaches undermine financial security and interfere with banking services (Aldasoro et al., 2021). The growing dependency on Fintech has multiplied these vulnerabilities with cybersecurity resilience being a determining factor of long term Sustainable banking practices (Tiberius et al., 2022). By identifying key vulnerabilities, the research will help banks enhance their risk management strategies and improve resilience through technological advancements like FinTech. Managing these risks by effective regulatory frameworks, advances in technology, and proper risk management strategies is necessary for long-term banking sector sustainability. Although previous research has separately analyzed these risks, this research will be looking at their combined effects, providing an integrated perspective of their implications for financial institutions. This research seeks to examine how these risks affect sustainability.

The sustainability of Pakistan's banking sector is increasingly challenged by financial risks, cybersecurity threats, and performance inefficiencies. Financial risks, including credit defaults and market volatility, undermine the sector's stability, while cybersecurity threats expose banks to data breaches, fraud, and regulatory non-compliance. Additionally, performance risks such as operational inefficiencies and outdated technological frameworks limit the sector's ability to compete and innovate. Despite the potential of FinTech to enhance banking resilience, improve efficiency, and mitigate these risks, its integration remains limited due to regulatory barriers, digital infrastructure constraints, and trust concerns. The relationship between these risks and banking sustainability remains underexplored, particularly in the context of developing economies like Pakistan. The purpose of this study to evaluate the effect of financial, cybersecurity, and performance risks on banking sector sustainability while exploring the role of Technology in mitigating these challenges. The findings will provide insights into strategies for strengthening banking resilience, regulatory frameworks, and industrial developments to ensure a sustainable financial ecosystem.

Objectives of the Study

- To examine the influence of Performance Risk on Sustainability Performance of Financial Institution in Pakistan.
- To determine the Financial Risk impact on Sustainability Performance of Financial Institution in Pakistan.
- To measure whether the cybersecurity risk on the sustainability Performance of Financial Institution in Pakistan.

Research Questions

- Does Performance Risk effect on Sustainability performance of Financial Institution in Pakistan?
- Does Financial Risk effect on Sustainability Performance of Financial Institution in

Pakistan?

- What is the impact of cybersecurity risk on the sustainability Performance of Financial Institution in Pakistan?

Literature Review

Financial Risk and Sustainability

Financial risk includes issues of possible monetary and economic loss. Financial risk is the risk of losing money on a business or investment. Some of the more well-known and specific financial risks are credit risk, liquidity risk, and operational risk (Phau, Teah and Lee, 2009). Financial risk is a kind of threat that can lead to damage of money to concerned parties. Existing literature identifies financial risk as an important and persistent type of risk that tends to be a reflection of economic uncertainty (Mohammad & Asutay, 2020). Financial risk is also an important obstacle to sustainability in that it reduces a company's capacity to fund long term sustainable ventures. The counterparty default risk, for example, raises the cost of borrowing and lowers access to capital, and thereby makes it more difficult for businesses to secure finance for renewable energy projects and other sustainability measures. Firms with high financial risk can struggle to obtain the funds required to achieve sustainability targets, hindering their overall ability to embrace green practices (Williams, 2019).

High risk in terms of finances dissuades investors and banks from funding long term sustainability initiatives, including green power and social development programs. High loan default rates can compromise the stability of banks, diminishing their capacity to lend to companies and individuals. This can hamper economic growth and sustainability (Djebali, N.; etc 2020) .A Company's ability to invest in long-term sustainability projects hampered by liquidity risk that is defined as the incapability to satisfy short-term financial obligations. Businesses with liquidity problems sometimes put short-term financial stability ahead of long-term strategies, postponing investments in waste reduction and renewable energy. Supporting sustainability requires effective liquidity management (Johnson & White, 2020). The perceived barrier is an estimate of the individual of how difficult the social, personal, ecological, and economic obstacles standing in desired goal status (Pruett, M.; Shinnar, R; et al 2009).

H1: Financial risk has negative relationship with sustainability performance.

Performance Risk and Sustainability

Performance risk means fear of loss that can be incurred when brand, product, supplier fails to meet expected performance standards (Horton, 1976 cited in Ha, 2002). Performance risk is also referred to as a quality risk. Functional risk and performance risk are synonymous. Users are concerned that their online game accounts information, like virtual money, treasure, credit cards would be stolen or used by others (Chen, L.S.L.; etc 2011). Inefficient performance diminishes capacity to invest in sustainable projects, including green finance or social development projects. Businesses face performance risks due to regulatory modifications that compel them to maintain financial stability while at the same time upholding conformity with sustainability-driven policies (Gatzert & Heidinger, 2019). Performance risk is the big threat to businesses as it widens financial volatility lowers the green investment, generates regulatory burdens, and lowers consumer confidence

(Gatzert & Heidinger, 2019;)
The perceived obstacles may affect the pronouncements not to participate in innovative expertise; for example, when a business chooses not to exploit the chances carried on by novel types of direction necessities because of absence of information (Kebaili, B.;et al 2017). People perceive that the performance of mobile banking and the working of online platforms would not be effective, and it may lead to possible financial loss (Xie et al., 2021). Within the fintech industry the performance risk refers to the possibility of disappointment or functional problem issues. Many studies have also supported findings that performance risk negatively impacts fintech's adoption (Ryu, 2018). Individuals with perception and judgment obstacles perform irresponsibly, thinking about oneself and assuming incorrect things. Perceived obstacles can directly affect decisions not to invest in novel equipment. It is well documented that the intentions of those businesspersons to introduce their concerns have had a negatively affected by Perceived Blockades (Katundu, M.A.; et al 2016).

H2: Performance risk has a negative relationship with sustainability.

Cybersecurity Risk and Sustainability

According to Cebula and Young in (2010), Cyber risk is a type of operational risk related to technical and information assets that may affect the availability, confidentiality, or integrity of data and information systems. Cybersecurity risks pose a significant threat to the sustainability of the banking sector by undermining financial stability, operational resilience, and consumer trust. Cyberattacks, such as data breaches, ransom ware, and fraud, can lead to significant monetary losses, authority penalties, and reputational loss, which affect long-term sustainability (Nash & Solms, 2022). Furthermore, continuous cyber threats require banks to allocate extensive resources toward security infrastructure, increasing operational costs and reducing profitability (Aldasoro et al., 2021). A lack of robust cybersecurity measures can also disrupt essential banking services, impacting financial inclusion and economic growth (Bouveret, 2018). Thus, strengthening cybersecurity frameworks is crucial for ensuring the sustainable development of the banking sector. Cybersrcurity threats have a range of effects on sustainability, influencing social, economic, and environmental aspects. Data centers use 1 percent of the global electricity, according to a Worldwide Energy Agency estimate, and this demand might rise during cyber disasters. Rise in electronic waste may result from ongoing cyber-attacks and the requirement for stronger cyber security defenses.

H3: Cybersecurity risk has a negative impact on banking sector sustainability.

Theoretical Foundation and Research Model

Theory of Perceived risk and Technology Acceptance Model (TPR and TAM)

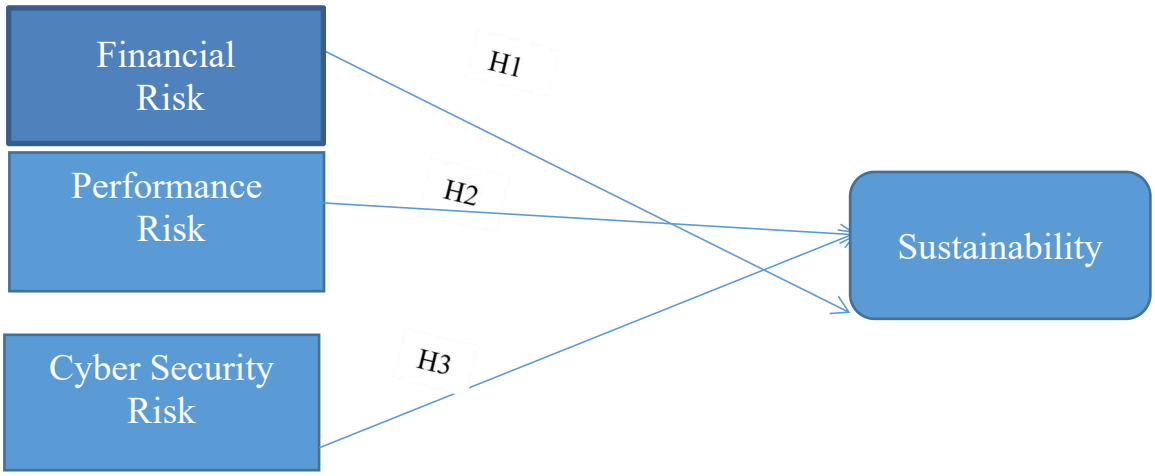
The theory of Perceived Risk (TPR) and the Technology Acceptance Model (TAM) are the key models of user behavior towards new technologies, especially in the financial industry. As TAM accounts for technology adoption, Theory of Perceived Risk is important in signifying the uncertainty and loss possibilities that drive user resistance. These models give a better insight into how risk perception can influence the acceptance of financial innovations such as digital banking and online payments. Bauer (1960) proposed a theory of consumer risk that highlighted how customers' knowledge of risk equated to uncertainty about the unfavorable outcomes of their choices. The theory of Perceived Risk suggests that individuals assess potential losses

before adopting a service or technology. According to Yong-Hui Li,(2009) the perceived risks discourage the users from adopting digital services (Jing-Wen Huang, 2009).The Pakistan people possess positive potentiality to use digital financial services but have negative impact on adoption intention through perception of risk.

The above study focused exclusively on the risks perceived from using Fintech that discourage individuals from adopting Fintech. (Li-Min Chuang, 2017) Used Technological Acceptance model to understand the consumer's behavioral intention towards fintech by means of integration of brand and service trust (Chua Chang Jin, 2019). Research on adoption of Malaysia's digitalized financial goods and services by consumers, suggested Technology Acceptance Model with the user alertness acting as an arbitrator.

The research identified factors influencing adoption of financial technology goods and services and established the damaging impact of perceived risk on user alertness of financial Technology goods and services. Zhongqing Hu et al., (2019) extended Technology Acceptance Model that used perceived risk, a key customer's trust determining factor for adoption of fintech and found negative impact of perceived risk over fintech adoption intention.

Figure 1. Proposed Research Model



Methodology

The following sections illustrate how data has been gathered, measured, and analyzed in this research.

Research Design

A quantitative research design is used in this study. This research uses a questionnaire method intended to gather information for testing the validity and reliability of the hypothesis of model and research. Usually, every question on a questionnaire is on a five-point Likert scale from 1 ("strongly disagree") to 5 ("strongly agree"). Two Hundred and fifty (250) questionnaires were distributed between Fin-Tech users and employees of banks who belonged to varying demographic backgrounds and the response was obtained from 194 employees of bank employees and Fin-Tech users.

Sampling and Data Collection

The target population involves employees and consumers of banks. The data is collected using primary sources, from the banking sector and fintech users. The target respondents are Pakistanis aged 18 and above, who maintain a bank account and from those customers who using different Financial Technology tools such as Mobile Banking Apps, Internet Banking, and Digital Wallets for payments and transactions. Both genders are included as participants and currently live in Pakistan. The sample size of this study is 194 bank consumers and employees. The sampling method used for the study is Convenience Sampling.

3.3: Data Analysis Techniques:

This study uses Structural Equation Modeling (SEM) to explore the causal relationships among the variables.

Data Collection Instruments

Constructs	No of Item	Sources
Performance Risk	3	Ryu (2018)
Financial Risk	3	Ryu, H.-S, (2020)
Cybersecurity Risk	3	AbdulRahim et al. (2022)
Sustainability	4	Ziemba, E. (2019) and AbdulRahim et al. (2022)

Findings and Results

Participants Profile

The gender distribution of the research was 38.5% female and 61.5% male. The participants were between the ages of 20 and 60 and older. Ages 20 to 29 accounted for 34% of the population, followed by 30 to 39 (27.5%) and 40 to 49 (19%). 12.6% of them were between the ages of 50 and 59. Just 6.9% of the sample as a whole consisted of those over 60. Similarly, 33.2% of those with a master's degree and 49% of those with a bachelor's degree fulfilled the standards.

The proportion of respondents possessing an MS/M.Phil degree was 15.4%, while 2.4% had a PhD. In addition, 18.2% had one to three years of experience, and 13.4% had less than a year. 25.5% of the sample consisted of participants with 4–7 years of expertise, whereas 21.1% had 7–10 years. The total sample size, 21.9% of participants had 10 years or more of experience. 2.4% of respondents held a PhD, compared to 15.4% who held an MS or M.Phil. In addition, 18.2% had one to three years of experience, whereas 13.4% had less than a year. Twenty-five percent of the sample consisted of participants with four to seven years of experience, and twenty-one percent had seven to ten years. Of the total sample size, 21.9% of participants had ten years or more of experience.

Table 1: Correlation Analysis

Correlations				
	PR	CR	FR	SUS
PR	1			
CR	-.336	1		
FR	-.438**	-.582**	1	
SUS	-.351**	-.360**	-.496**	1

Perceived Risk (PR) and Cyber Risk (CR) and Financial Risk (FR) demonstrate statistically important connections to Sustainability (SUS) in the correlation table. The variables show negative relationships with each other. Higher perceived risk levels indicate lower sustainability levels according to the correlation between Perceived Risk (PR) and SUS (r = -0.351). The increase of Cyber Risk (CR) causes Sustainability outcomes to deteriorate based on a negative relationship (r = -0.360). Financial Risk emerges as the most destructive factor for sustainability based on the -0.496 correlation value between these variables.

Table 2: Outer Loadings

Variable	FR	SUS	CR	PR
CR1			0.979	
CR2			0.979	
CR3			0.981	
FR1	0.987			
FR2	0.985			
FR3	0.987			
PR1				0.978
PR2				0.976
PR3				0.975
S1		0.757		
S2		0.727		
S3		0.799		
S4		0.881		

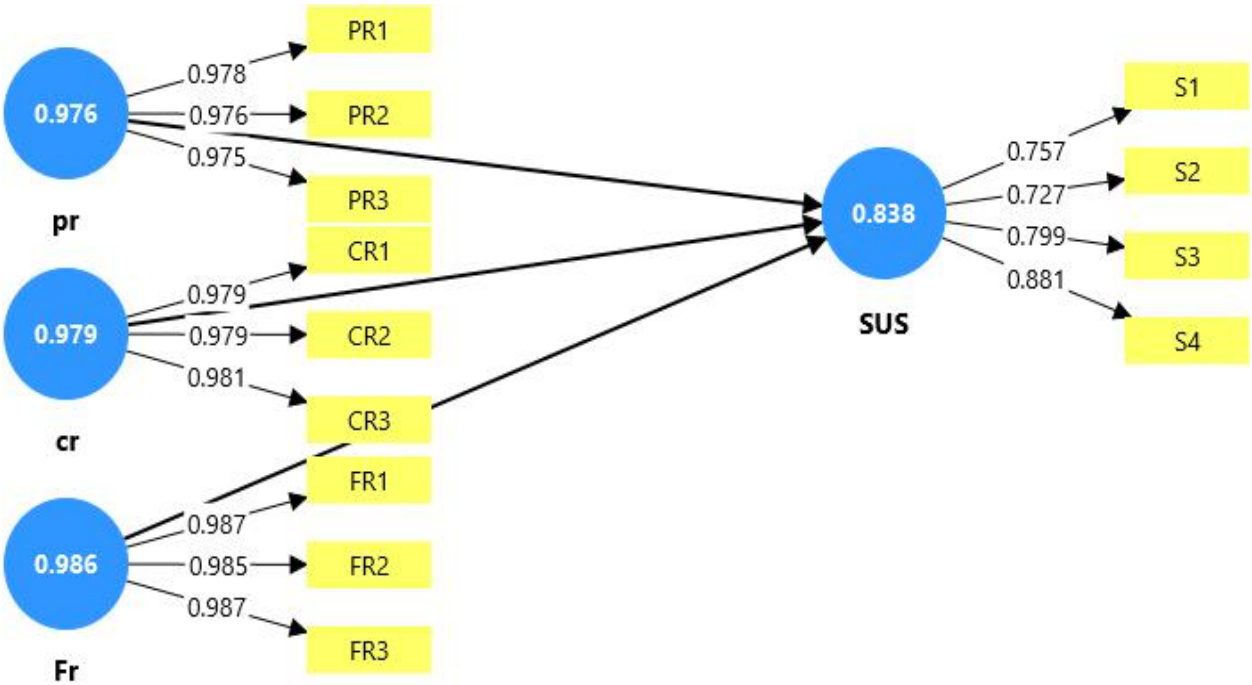
We present the factor loadings in the table as a means of indicating the strength of the relationships between each item and its respective construct, to show the validity of the measurement model. Financial Risk (Fr) displays extremely high factor loadings for its three items (FR1 = 0.987, FR2 = 0.985, FR3 = 0.987), indicating that these items are a strong representation of the Financial Risk construct. Cyber Risk (cr) also shows high loadings (CR1 = 0.979, CR2 = 0.979, CR3 = 0.981), indicating that these items are a strong representation of the construct measuring Cyber Risk. Performance Risk (pr) also shows strong loadings (PR1 = 0.978, PR2 = 0.976, PR3 = 0.975), indicating that these items are a reliable representation of the Performance Risk construct. Conversely, although constructions factor gather slightly lower sustainability values, they still garner acceptable loadings and are well-measured. As I have noted, sustainability's factor loadings range from 0.727 (S2) to 0.881 (S4). The loading that S4 generates is the highest of any item and, therefore, indicates that this construction contributes most significantly to the sustainability-defining group. However, all of the construction items that generate sustainability factor loadings do so with good convergent validity and contain no bad measurement surprises. While S4 is the standout item, the sustainability construction is more variable than the other constructions, which have near-perfect factor loadings.

Table 3: Construct Validity and Reliability

Variable	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
FR	0.986	0.987	0.991	0.973
SUS	0.838	1.162	0.871	0.629
CR	0.979	0.982	0.986	0.960
PR	0.976	0.983	0.984	0.954

The test of reliability and validity of the constructs confirms that the study constructs have strong internal consistency and reliability. Measures of internal consistency were above the acceptable threshold of 0.7 for all constructs, demonstrating that the items within each construct are measuring their respective concepts consistently. Financial Risk had an internal consistency of 0.986, indicating almost perfect reliability. Cyber Risk had an internal consistency of 0.979, and Performance Risk had an internal consistency of 0.976, also indicating high to almost perfect reliability. Additionally, all constructs composite reliability values are above 0.9, with Financial Risk (0.991), Cyber Risk (0.986), and Performance Risk (0.984) showing notably strong reliability. Though slightly lower, the Sustainability composite reliability value (0.871) still meets the necessary threshold, reinforcing the reliability of that construct. These findings are consistent with the composite reliability (rho_a) values, which also confirm the robustness of the measurement model. With regard to convergent validity, the average variance extracted (AVE) values show that each of the constructs explains a significant amount of variance in its items.

Measurement Model



Hypothesis Testing Structured Model

Results of Direct Effects

H1: Financial Risk (FR) → Sustainability (SUS)

The beta value for this relationship is -0.334, indicating a negative impact of financial risk on sustainability. This suggests that as financial risk increases, sustainability decreases. The standard error (-0.380) and standard deviation (0.366) provide additional statistical insights, while the p-value (0.00) confirms that the result is highly significant. Hence, the hypothesis is approved.

H2: Cyber Risk (CR) → Sustainability (SUS)

The value of beta, which is -0.699, shows a strong negative effect of cyber risk on sustainability. This means that the higher the cyber risk, the lower the sustainability level achieved. This finding has further reliability support from the standard error of -0.724 and the standard deviation of 0.350. The p-value of 0.00 makes the finding statistically significant and suggests we should adopt the hypothesis.

H3: Performance Risk (PR) → Sustainability (SUS)

The beta value of -0.157 indicates a negative relationship between performance risk and sustainability, though weaker compared to financial and cyber risk. The standard error (-0.181) and standard deviation (0.135) suggest some variability in the data, but the p-value (0.00) confirms that the relationship is still statistically significant. As a result, this hypothesis is approved.

Table 4: Results of Direct Effects

Hypothesis	Relationship	Beta	S.E	STDEV	P	Decision
H1	FR-> SUS	-0.334	-0.380	0.366	0.00	Approved
H2	CR -> SUS	-0.699	-0.724	0.350	0.00	Approved
H3	PR -> SUS	-0.157	-0.181	0.135	0.00	Approved

Discussion and Conclusion

This research delivers an extensive analysis of the extent to which financial risk, cybersecurity risk, and performance risk contribute to the banking sector's sustainability in Pakistan. Employing Structural Equation Modeling (SEM) methods through Smart PLS. This study investigates the independent effects of these risks on banking sustainability. The results of the study are indicative of a negative relationship between financial risk and banking sustainability, implying that economic instability, credit defaults, and market volatilities debilitate the long-term viability of banks. Cybersecurity risk is significant threat with data breaches, fraud and regulatory non- compliance reducing customer trust and financial stability. Performance risk in terms of operational inefficiencies and technology disruptions also displays a significant negative influence on Sustainability thus the need for robust risk management strategies. These findings highlighted the critical necessity for banks to create detailed risk mitigation plans in order to fight these risks and maintain long term stability in an increasingly volatile financial environment. The findings indicate that financial and performance risks pose sustainability Challenges, sound risk management practices can counteract their negative impact. Overall, this research emphasizes banks requirements to strengthen cybersecurity protocols, tighten financial risk management system, and enhance service efficiency in order to facilitate sustainable growth. By

addressing these risks, Pakistan's banks can create increased consumer trust enhance operational effectiveness and help to achieve a more stable and sustainable financial system. Therefore, proactive risk management is essential to guarantee a stable and sustainable banking industry. By making investment in advanced cybersecurity solutions, enhancing risk mitigation strategies and optimizing performance in banks can enhance their resistance to new threats. An efficiently protected, effective and risk-conscious banking sector will not just promote consumer confidence but also ensure long-term sustainability, which will lead to financial stability and economic development within Pakistan.

Future Directions

This research offers important information on how cyber, financial, and performance risks affect the sustainability of the banking industry in Pakistan. Future studies can build on this by investigating the role of regulatory system in preventing these risks and evaluating efficacy of existing policies. Another important area of research would be to examine how emerging technologies like blockchain, Artificial intelligence, and quantum computing can improve cybersecurity and operational effectiveness. One important limitation of this study is its singular focus on a single country, which will reduce the potential generalizability of the findings. Cross-country comparisons in future Studies could consider analyzing how varied regulatory frameworks, technological innovation and economic circumstances influence the correlation between financial risks and banking sustainability. Widening the scope of research to various regions would provide a more holistic view of challenges faced by the global banking sector and risk mitigation mechanisms.

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