

IMPACT OF CYBER SECURITY COST ON THE FINANCIAL PERFORMANCE OF E-BANKING: MEDIATING INFLUENCE OF PRODUCT INNOVATION PERFORMANCE

Khalid Khalil^{1*}, Sheikh Raheel Manzoor², Muhammad Tahir³, Nisar Khan⁴, Khalid Jamal⁵

^{1*} Assistant Professor, IQRA National University, SWAT, Campus, Pakistan; ² Lecturer, The University of Agriculture, Peshawar, Pakistan; ³ Lecturer, Management Sciences and Commerce Department Malakand University, Pakistan; ⁴ Director Finance, Employees Social Security Institution, Labour Department, Government of Khyber Pakhtunkhwa, Pakistan;

⁵ Manager, Information Office, IQRA National University Peshawar, Pakistan.

Email: ^{1*} khalidkhalil774@yahoo.com, ² raheelmanzoor7861@gmail.com, ³ muhammadtahir19801980@gmail.com, ⁴ nisar_wazir@hotmail.com, ⁵ khalid.jamal@inu.edu.pk

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Abstract

Purpose of Study: The study objectives are to: a) conduct a meta-analytical review to analyze the association among cybersecurity costs, such as prevention and detection costs (PDC), response costs (RC), development costs (DC), and indirect costs (IC), on the e-banking product innovation performance (PIP) and financial performance (FP), b) to evaluate the causal association of cyber security costs, i.e., (PDC, RC, DC, and IC) on PIP and FP; and c) investigate the mediating effects of PIP in a relationship between PDC, RC, DC, IC and FP.

Methodology: The study sample was the managerial cadre employees of various electronic banks (e-banks) working in Pakistan. The survey was conducted by distributing the questionnaire among the employees of e-banks working in Pakistan. The collected data were estimated via multivariate statistical techniques.

Findings: The results of the study showed that a) the costs associated with cybersecurity, specifically PDC, RC, and DC, have a statistically significant effect on PIP and e-banking FP, whereas IC has a negative significant influence on the PIP and FP, b) the PIP has a statistically significant effect on e-banking FP, and c) the PIP partially mediates an association between PDC, RC, DC, and FP, whereas, PIP insignificantly mediates in a relationship amongst IC and e-banking FP.

Application of Study: The study will be applicable in the modern electronic banking (e-banking) systematic risk control and information security solution.

Novelty: The study is novel in the context of cyber security costs, including (PDC, RC, DC, IC) by measuring its influence on PI and e-banking FP.

Keywords: Cybersecurity Cost, Ebanking, Financial Performance, Meta Analysis, Product Innovation Performance.

INTRODUCTION

Electronic banking (e-banking) plays a key role in the financial growth of the banks (Sandhu & Arora, 2021). The e-banks, electronic devices facilities, such as, automated teller machine (ATM), e-kiosks, personal digital assistance (PDA), e-wallets, etc., make the banking service more convenient to the consumer, that results in greater financial growth (Soylemez & Ahmed, 2019). Nazaritehrani & Mashali (2020), documented that the cyber security breach is the main problem of the financial growth of e-banking. The e-banks employed the cybersecurity to combat cyber crimes (Khalil, Usman & Manzoor, 2020). Financial institutions pay hundreds of millions a year for their cyber security (Columbus, 2020). Furthermore, cyber security impacts a firm's ability to innovate (Njoroge, 2017). Consequently, financial services industry business models have compelled banks to launch new business platforms in an attempt to entice clients and improve the client experience. Banks that offer e-banking services to their clients are investing a significant amount on cybersecurity to prevent cyber attacks. These cyber security costs consist of prevention and detection cost (PDC), cyber crime response cost (RC), cyber security development cost (DC) and indirect cost (IC) (Njoroge, 2017). However, the association between e-banking, product innovation performance (PIP) and financial performance (FP) are limited and incongruent in the literature (Islam et al., 2019; Jepchumba & Simiyu, 2019; Thankgod et al., 2019).

Furthermore, scholars reported that very few studies measure the association among cyber security cost, e-banking and FP (Njoroge, 2017; Njoroge & Njeru, 2017; Odhiambo & Ngaba, 2019). There exist very few studies measuring the correlation between cyber security cost and e-FP of banking around the globe. Still yet, no study has yet been conducted that specifically examines the mediating effect of PIP in the association between cyber security cost and e-banks FP, specifically in Pakistan.

Therefore, the fundamental objectives of this study ought to:

- a) conduct a meta-analytical review to analyze the association among PDC, RC, DC, IC, PIP, and FP;
- b) to evaluate the causal association of cyber security costs, i.e., (PDC, RC, DC, and IC) on PIP and FP, and

c) investigate the mediating effects of PIP in a relationship between PDC, RC, DC, IC and FP. In addition, this study attempts to bridge the gaps within the existing body of information about e-banking in Pakistan. The paper also explains the cyber security costs, PIP, and FP of e-banking.

LITERATURE REVIEW

In [Jordan, Altobishi et al.\(2018\)](#), reported that e banking (convenience, privacy, and customization) have a significant positive impact on customer allegiance, which in turn influences the e-banking FP. [Berry & Berry\(2018\)](#), found that entrepreneurs lack the basic technological contingency planning mechanisms, and are less preapare to prevent their knowledge assets from cyber attacks. As a result, smaller firms run a significant chance of harming their infrastructure because they lack the capabilities and information systems expertise to put the research into practice ([Berry & Berry, 2018](#)).A large portion of the research is presented as grey literature mostly on hazards of cyber security for smaller businesses ([Berry & Berry, 2018](#)).The study was done in Kenya to find out how much cybersecurity cost affects the performance of financial institutions. The findings showed a significant association among FP and preventing and detecting cost (PDC), response cost (RC), developing (DC), and indirect expenses (IC) ([Njoroge, 2017](#)). Since no study focuses on the costs that banks suffer as a result of cyberattacks and how it affects banks performance ([Njero & Gaitho, 2019](#)).

H₁:PDC has a significant effect on e-banking FP.

H₂:RC has a significant effect on e-banking FP.

H₃:IC has a significant effect on e-banking FP.

H₄:DC has a significant effect on e-banking FP.

In Jordan, [Ahmad and Al Zu'bi \(2011\)](#), carried out a research to look at the functioning e-banking and consumer satisfaction based on IT theory. The results of the study demonstrated that clients loyalty is positively associatedwith e-banking usage (ease of access, simplicity, privacy, security, contents, style, efficiency). The study was carried out in Kenya to determine how response costs affected the creation of financial products. Response expenses are covered (compensation and legal cost). The findings demonstrated that RC was indeed a key predictor of financial product development. The researchers underlined the differences between the costs banks incur as a result of cybercrime and how it impacts innovation and performance because there have been no studies that focus on these issues specifically ([Njoroge & Njeru, 2017](#)).

In order to evaluate the "impact of cybercrime associated cost of the innovative products," a study was carried out in Kenya ([Njoroge, 2017](#)). The analysis found that the PDC costs, like insurance payments, direct costs, including maintaining the market, IT compliance costs, direct monetary loss, costs for remuneration and litigation expenses, and indirect costs, including reputation harm and loss of clients confidence, were significant concerns and had a significant impact on the creation of an innovation performance. The researcher emphasized the gap because none of the studies focused on the expenses that banks incur as a consequence of cybercrime and FP ([Njoroge, 2017](#)). Based on the theory of information asymmetry, In Kenya,[Jepchumba & Simiyu, \(2019\)](#) found that cost of e-banking system is the strong predictors of the banks' financial innovation performance. [Rabiu et al., \(2019\)](#), reported that, in Nigeria, e-banking has increased banks' ability to serve consumers efficiently through the use of technology, cut down on the period of time it takes to handle them, allowed new clients to create online accounts, and allowed consumers to connect their accounts at any time. Due to the limitations on studies that examine how financial innovation affects FP of e-banking FP emerging economies, researchers called attention to this gap ([Ullah, Afghan, Afridi, 2019; Zu et al., 2019](#)).

The study was conducted in Bangladesh to evaluate the impact of e-banking usage on banks' profitability. According to the research, banks with internet banking had greater ROA and ROE than banks without it. Nevertheless, the outcomes were small.Additionally, it was discovered that ROA and ROE decreased with the introduction of internet bank that were statically significant. The study's findings suggest that non-online banks make more money overall, albeit this could be due to the fact that it takes some time for the initial cost of providing online banking to be recovered. Researchers called attention to the gap because there haven't been many recent studies examining how e-banking affects bank performance in poor nations ([Islam et al., 2019](#)).

H₅:PDC has a significant influence on PIP.

H₆:RC has a significant influence on PIP.

H₇:IC has a significant influence on PIP.

H₈:DC has a significant influence on PIP.

H₉: PIP has a significant influence on e-banking FP.

There are very few research studies that assess the PIP's mediating influence in the relationship between the cost of cyber security and e-banking FP. Product innovation has, therefore, been included in a number of studies as a mediating factor that affects business performance. The study was carried out in Taiwan to identify the factors that influence the behaviour

of product innovators. The findings showed that the behaviour of innovation in product development and business success are interdependent (Thongsri & Chang, 2019). Another investigation was conducted in Georgia to evaluate the repercussions of product innovation in an organization together with environmental factors and a relationship between firm performance. The findings showed that organizational characteristics and FP are strongly intermediated by product innovation (Vincent, Bharadwaj & Challagalla, 2004).

A study was conducted in Zimbabwe to assess the innovation's ability to influence the performance of a company's network of businesses. The findings showed that the innovation is considerably mediate in between the corporate network and performance (Mpando & Sandada, 2015). The outcomes of a study indicated that product innovation strongly mediates among R&D investment and market success (Sharma et al., 2016). Another recent study was conducted in Pakistan to evaluate the intermediary influence of product innovation in the context of the interplay between creative culture and FP. The finding demonstrates that product innovation considerably mediates the interaction between an inventive market outcomes (Zafar & Mehmood, 2019).

H₁₀: PIP significantly mediates between the PDC and FP

H₁₁: PIP significantly mediates between the RC and FP

H₁₂: PIP significantly mediates between the DC and FP

H₁₃: PIP significantly mediates between the IC and FP

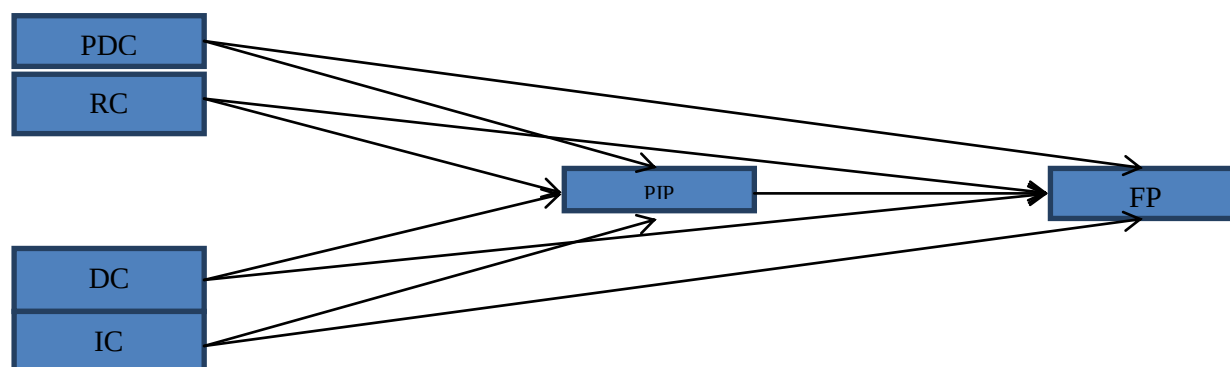


Figure 1: Framework, PDC=Prevention & Detection Cost, RC=Response Cost, DC=Direct Cost, IC=Indirect Cost, PIP=Product-Innovation-Performance, FP=Financial-Performance

META-ANALYSIS

For meta-analysis, the PRISMA 2020 was employed (Frampton et al., 2017). A total of three hundred fifty six articles covering the years 2009 to 2019 were considered; in which two hundred fifty four, articles were subsequently discarded. For study searches, the researchers employed the databases from Research Gate, Scopus and Google Scholar. The investigator searched using the terms "cyber security costs," "FP," and "PIP." The search terms were also given codes by the researcher, i.e., cost (A), PIP (B), and FP (C). The eligibility rules were specified as quantitative researches involving the computation of correlations (r). Articles were chosen in accordance with criteria (n=45) based on the research factors. According to the result, forest-plot, 13 of the 14 research (n=14) revealed a positive correlation between the cyber security cost and e-banking FP, while one study (n=1) revealed a negative correlation. Second, one study (n=1) found a negative correlation among PIP and e-banking FP and twenty eight investigations (n=27) verified the presence of a positive link between PIP and e-banking FP. Finally, four studies (n=4) verified a positive link between cyber security costs and PIP, while only one research (n=1) revealed a negative correlation. Below is a list of the papers and journals used in the meta-analysis (see Table 1). The outcome of the forest plot is also mentioned in (Figure, 3, 4 & 5). The PRISMA process flow is shown (Figure 2).

Table 1: Related Studies

S#	Authors	Journals	N	Countries
1	Wahab et al. (2009)	The Asian Journal of Tech Mgt	674	Kual.Lumpur
2	Haque et al., (2009)	Journal of Applied Sciences	251	Malaysian
3	Charles & Wilfred (2010)	African Journal of Bus Mgt	301	Nigeria
4	Auta (2010)	Jour'l of App Quantit Methods	1001	Nigeria
5	Baloch & Zahid (2011)	Abasyn Journal of Social Sciences.	252	Pakistan
6	Ahmad & Al-Zu'bi (2011)	Int'l Journal of Mktg Studies	186	Jordan
7	Akinyosoye–Gbona (2011)	Australian Jour'l of Bus & Mgt Research	401	Sierra Leone
8	Suleiman et al. (2012)	American Journal of Economics	251	Malaysia

9	Bamrara et al. (2012)	Jour'l of Internet Banking & Commerce	102	India
10	Adewoye (2013)	Int'l Review of Mgt and Bus Research	141	Nigerian
11	Brock & Levy (2013)	Online Jour'l of App Knowledge Mgt	133	NS.Eastren
12	Fonchamnyo (2013)	Int'l Journal of Economics & Finance	211	Cameroon
13	Wambua & Datche, (2013)	Int'l Journal of Sciences	201	Kenya
14	Mehmood et al. (2014)	Journal of Mgtt Infor System	211	Pakistan
15	Khurshid et al. (2014)	Int'l Journal of Acctng & Financial Repting	201	Pakistan
16	Arcuri et al. (2014)	European Financial Mgtt Meetings	22	Italy
17	Dzomira (2014)	Risk & Control: Fincial Mrkts & Ins	23	Zimbabwe
18	Nabil & Alber (2015)	Int'l Jou'l of Eco and Fin	14	Egypt
19	Belás et al. (2016)	Jou'l of Security and Sust Issue	320	Slovakia
20	Sadekin & Shaikh (2016)	Int'l Journal of Eco, Fin & Mgt Science	121	Bangladesh
21	Mugari et al. (2016)	Mediterranean Jou'l of Social Science	49	Zimbabwe
22	Al-Sharafi et al., (2016)	Journal of Eng and App Science	199	Jordanian
23	Chiu et al. (2016)	Int'l Journal of Fin Service Mgt	501	Philippines
24	Salimon e al., (2017)	Int'l Jou'l of Bank Marktg	267	Emerald
25	Njoroge & Njeru (2017)	Int'l Jou'l of Science & Res	81	Kenya
26	Barasa et al. (2017)	Saudi Journal of Bus & Mgt Studies	67	Kenya
27	Osewe.(2017)	Int'l Jou'l of Eco & Mgt	221	Kenya
28	Ojeka et al. (2017)	Int'l Rev of Mgt & Mtkg	22	Nigerian
29	Gathungu (2018)	Int'l Jou'l of Edu and SS	44	Kenya
30	Altobishi et al. (2018)	Int'l Jou'l of Marktg Studies	176	Jordan
31	Gunaratnam et al. (2018)	Jou'l of Sociological Res	551	Sri Lanka
32	Malik et al. (2018)	Glbl Jou'l of Mgt, SS & Hum	11	Pakistan
33	Castillo & Falzon (2018)	Review of Eco & Fin	251	Malta
34	Njoroge & Mugambi (2018)	Int'l Acad Jou'l of Eco & Fin	221	Kenya
35	Adjei (2018)	Int'l Journal of Com & Mgt Res	703	Ghana
36	Berry & Berry (2018)	Int'l Journal of Bus & Risk Mgt	371	USA
37	Vikram & Gayathri, (2018)	Int'l Journal of Appl'd Maths	22	India
38	Naz (2019)	Journal of Isl Bus & Mgt	402	Pakistan
39	Odhiambo & Ngaba (2019)	Int'l Academic Journal of Eco & Fin	123	Kenya
40	Jepchumba & Simiyu (2019)	Int'l Jou'l of Fin and Acctng	40	Kenya
41	Mohamud & Mungai, (2019)	The Stgic Journal of Change Mgt	214	Kenya
42	Saji (2019)	Int'l Journal of Sci & Mgt Studies	201	Indian
43	Rabiu et al. (2019)	Int'l Journal of Acad Res in Bus & SS	151	Nigeria
44	Abayomi et al (2019)	Int'l Journal of Bus and SS	602	Nigeria
45	Islam et al. (2019)	Eurp Journal of Bus & Mgt Res	31	Bangladesh

Note. Studies including in Meta-Analysis

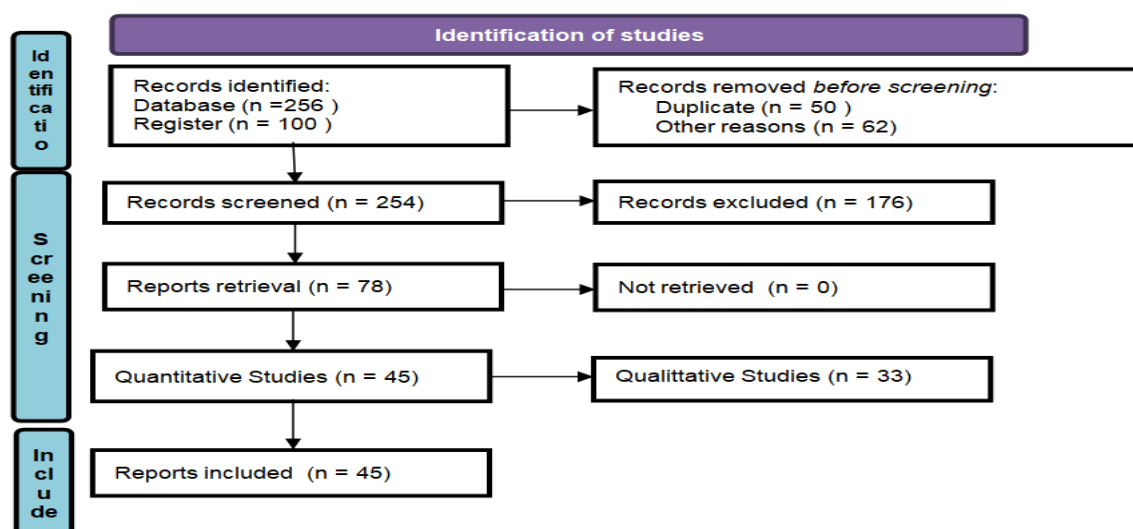


Figure 1: PRISMA (2020) Model

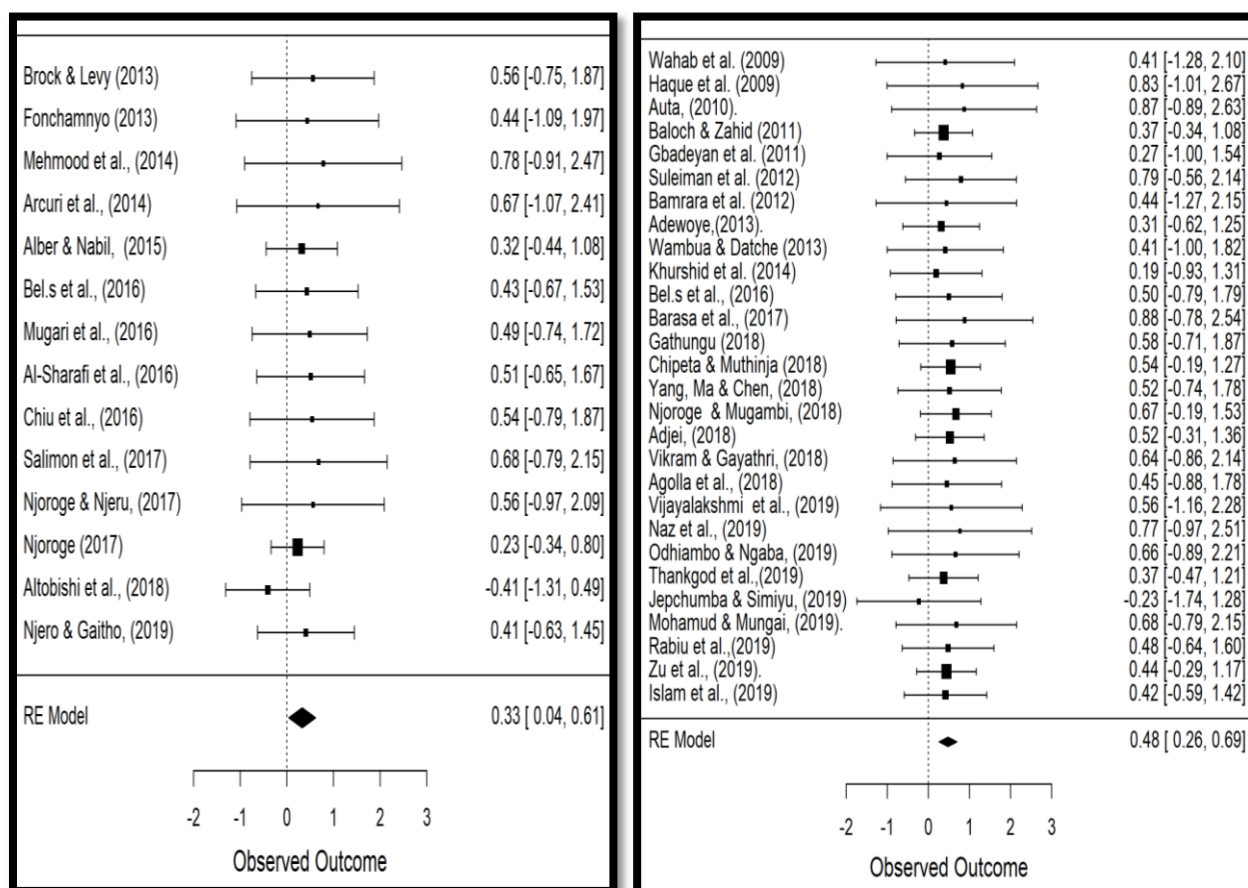


Figure 2: Costs and E-Banking Performance **Figure 3: PIP and E-Banking Performance**

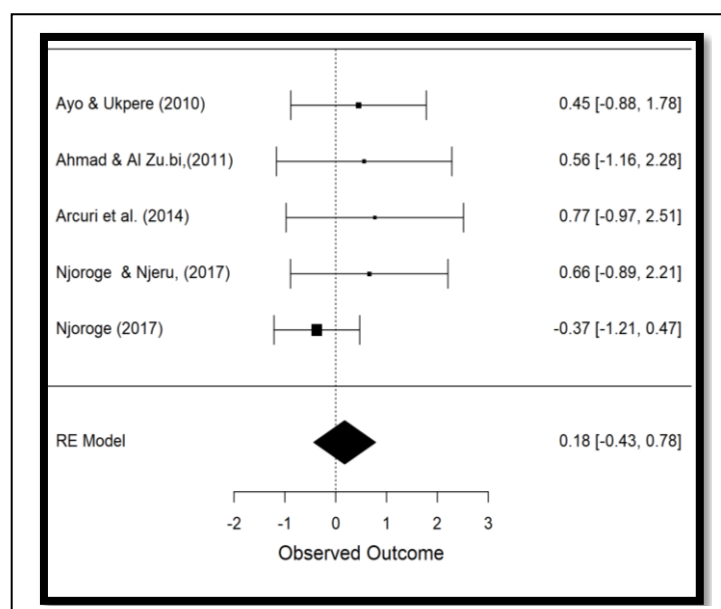


Figure 4: Costs and PIP

METHODOLOGY

Population & Sample

The structured questionnaire has been used to evaluate and obtain information. Before the main study began, a preliminary survey of 60 respondents was completed in accordance with [Conelly \(2010\)](#). The pilot study, is the randomized study used to assess the viability of a procedure that could be applied in a wider investigation ([Malmqvist et al., 2019](#)). The

effectiveness of recruiting, retention, selection, screening, testing procedure, and the inclusion of innovative interventions evaluated by the pilot survey (Fraser et al., 2018).

The current study employed probability stratified sampling to select data from the managerial cadre staff members of different banks located in Pakistan. The statistics shown that the e-banking users in Pakistan are 2.9 million. Employees of Pakistani banks' management cadre constituted the survey's population. The sample size was estimated via (Yamane, 1967) formula. Following the computation, the sample was made up of two hundred twenty four managers and three hundred thirty five operational managers. Professional enumerators used questionnaires to undertake face-to-face surveys. Enumerators also explain the survey to respondents and obtain their verbal consent to complete a survey. Participants have been further informed that study would have not divulged in private data. About five hundred and fifty nine questionnaires were distributed and five hundred fifty questionnaire were returned, depicting 98%, which is appropriate response rate (Sekaran & Bougie, 2016). The participants' descriptive statistics are displayed in Table 1.

Table 2: Demographic(n=550)

Gender	Freq	Percentile
Male	408	74.2
Female	142	25.8
Sum	550	100.0
Age	Freq	Percentile
20-30 year	340	61.8
31-40 year	181	32.9
41> above	29	5.3
Sum	550	100.0

Source: Author's Findings

Note. Freq:Frequency

MEASURES

Total 43 element constructs make the questionnaire, which are represented in Table 2. Respondents pick the answer on a predefined five point scale which adequately captures their views. This scale is frequently used to determine how strongly respondents believe or disagree with a particular subject. According to Sekaran & Bougie (2016), it may be wise to maintain the midway (mean) on this scale if a subject is very delicate. Two sections made up a questionnaire. Participants were asked to provide demographic information in Section 1 and to answer questions about their experiences related to cyber security cost in Section 2. A survey based was on self-evaluation measures. Twenty-nine items from Njoroge (2017) were used to measure cyber security costs. In addition, eight items, from Chen et al. (2015), and six items from Gounaris & Tzempelikos (2014) were used to measure product innovation performance and financial performance respectively. The assessment process also included demographic questions. Table 2 presents the measurements. The questionnaire was developed by first conducting a pilot study wherein we evaluated research experts to see if the questions were explicit and appropriate, and then altering the items based on their responses percentage. Cronbach's alpha coefficient was employed to quantify reliability in order to assess the quality of the question elements. The Reliability value was presented in Table 2 as (72.2 for CSC, 67.7 for PIP, 62.6 for FP). Reliability greater than 0.6, (Nunnally & Bernstein, 1994), indicate items are consistent. Moreover, the construct validity was checked using the cross loadings to obtain the adequacy of measurements (Sekaran & Bougie, 2010). The researchers used 0.5 standardized thresholds to determine the items validity recommended by (Hair et al., 2016). This means that each object must have least one dimension with a value of 0.5. As a result, it's possible that there is a cross-loading issue even when an object still has loadings values larger than 0.5 over various dimensions.

The average variance extraction (AVE) and composite reliability (CR) techniques are used to assess the convergent validity. This evaluation is essential for figuring out how closely various objects assessing the same idea align with one another. According to Table 2, the CR values for CSC (.737), PIP (.645), and FP representing (.604). These results demonstrate that the items have adequate convergent validity because they are greater than the 0.7 criterion established by Hair et al. (2016). As demonstrated in Table 2, the AVE values CSC (.737), PIP (.645), and FP representing (.604) all different. These values surpass the 0.5 level recommended by (Thompson & Daniel, 1996). The convergent validity testing shows that each constructs (CSC, PIP and FP) accurately measures its corresponding aspect. Finally, in order to determine how effectively items differentiate among concepts, the researchers look at the discriminant sufficiency. To make sure that no concepts are conceptually incompatible, this examination is crucial. As a result, the square correlation for each component is much lower than the AVE values, indicating the proper discriminant validity represented in Table 2. In order to assess the hypotheses, we used multiple regressions to assess the mediation impact under structural equation model (SEM) technique. The predictors are CSC and PIP, while the response variable is FP. The PIP is included as a mediator between CSC and FP. Primarily, we used CFA to evaluatethe relation in between observable and endogenous factors. The

CFA, CR, AVE, and reliability, measures are abridged in Table 2. The details of the construct validity of assessment items and the impact of the EFA are represented in Table 2.

Table 3: Measurement Model

Constructs	Items	Loadings	AVE	CR	Rel
Cyber Security Costs (AVE: .561, CR: .711, Rel: .722)					
PDC	1. Is very high to encounter the banks' IT compliance	.751	.511	.782	.611
	2. Affects bank's creative activities	.698			
	3. Affects banks' innovative services/products.	.588			
	4. Affects financial performance of the bank.	.701			
	5. Is very high in online platforms.	.741			
	6. Has effect banks' innovative services/products.	.569			
	7. Prevent clients against damages that arise from cyber attacks	.697			
	8. Deal with e-banking cyber attacks in online system	.599			
RC	9. Reimburse the victims	.654	.566	.792	.812
	10. Affects the banks' innovative services/products adoption rate	.748			
	11. Are linked with banks' compliance issue	.618			
	12. Affects the rate at which banks adopt innovated products	.581			
	13. Produce vigilant on the banks' innovative services/product adoption	.719			
	14. Take long period to cope up with cyberattacks	.715			
	15. Inhibit with daily banks' processes.	.595			
	16. Is secure for services/products.	.689			
IC	17. Inclines to reduce the number of clients	.511	.572	.702	.761
	18. Affects the banks' performance.	.614			
	19. Inclines to evade acceptance of services/products.	.708			
	20. Are risky and vulnerable	.604			
	21. Affects online service transactions, and new services/products.	.521			
	22. Establish an enormous quantity of an R & D cost	.701			
	23. Initiates the indirect damages from R & D.	.751			
	24. Controls novel financial innovation adoption.	.544			
DC	25. Affects adoption of novel services/products	.630	.582	.705	.752
	26. Affects cyber security maintenance.	.539			
	27. Mitigate banks' innovated services/products	.602			
	28. Mitigate banks' innovation rate and services/product adaptation.	.577			
	29. Improves cyber security quality.	.691			
Product Innovation Performance (AVE: .542, CR: .714, Rel: .756)		.			
PIP	1. Has achieved market share relative to the bank's stated objectives	.549	.542	.714	.756
	2. Has achieved sales relative to the stated objectives	.634			
	3. Has achieved return on assets relative to the stated objectives	.587			
	4. Has achieved a return on investment related to the stated objectives	.624			
	5. Has achieved profitability relative to the stated objectives	.547			
	6. Shows enhancement in product sales	.530			
	7. Shows increase in product return on investment	.629			
	8. Improves its product market share	.611			
Financial Performance (AVE: .531, CR: .707, Rel: .688)					
FP	1. How hay bank performed with respect to sales	.827	.531	.707	.688
	2. How hay bank performed with respect to profit	.527			
	3. How hay bank performed with respect to market share	.520			
	4. How hay bank performed with respect to return on asset	.622			
	5. How hay bank performed with respect to return on equity	.742			
	6. How hay bank performed with respect to return on investment	.702			

Note. PDC: Prevention and Detection Cost, RC: Response Cost, IC: Indirect Cost, DC: Development Cost, PIP: Product Innovation Performance, FP: Financial Performance, Rel: Reliability

In addition, the square root of AVE and its association with the each construct was estimated to check discriminating validity. The square root of AVE must be higher than to the correlation score of all factors, demonstrating no concern of discriminant validity (Henseler et al., 2015). In addition, fit indices find as adequate shown in Table 3.

Table 4: Discriminant Validity& Fitness

Factors	Mean	SD	1	2	3
1. Cyber Security Cost	3.1	.987	.748		
2. Product Innovation Performance	3.6	.952	.429	.736	
3. Financial Performance	2.9	.936	.201	.236	.728
Fitness Indices	Estimated Value		Standard		Authors
X ² /df	2.8		< 3		Hair et al. (2016)
GFI	.93		> .9		-do-
RMSEA	.06		< .08		-do-
CFI	.94		> .9		-do-
AGFI	.88		> .8		-do-
RMR	.05		< .08		-do-
NFI	.91		> .9		-do-
TLI	.92		> .9		-do-

Note. GFI: Goodness-of-fit-Index; RMSEA: Root-means-squares-of-approximations; AGFI: Adjusted-goodness-of-fit-Index; CFI: Comparitive-fit-index; NFI: Normed-fit-index; RMR: Root-means-residual; TLI: Tucker-Lewis-Index

DIRECT AND INDIRECT RELATIONSHIP

Direct Relationship

The SEM was used to assess the structural relation between latent and measured factors. The SEM amalgamates various standard techniques including hierarchical assessment in one step (Hair et al., 2016). Consequently, for evaluating the hypotheses the SEM was used. The hypothesis, H1, stated that PDC has a significant positive effects on FP. The results demonstrated that the PDC has positive effect on FP. As a result, H1 is supported ($\beta = 0.053$, $t = 3.5$, $p.05$). The hypothesis, H2, stated that RC has a significant positive effects on FP. The results demonstrated that the RC has positive effect on FP. As a result, H2 is supported ($\beta = 0.051$, $t = 3.9$, $p.05$). The hypothesis, H3, stated that DC has a significant positive effects on FP. The results demonstrated that the DC has positive effect on FP. As a result, H3 is supported ($\beta = 0.134$, $t = 7.8$, $p.05$). The hypothesis, H4, stated that IC has a significant positive effects on FP. The results demonstrated that the IC has negative effect on FP. As a result, H4 is rejected ($\beta = -0.006$, $t = -0.53$, $p.05$). The hypothesis, H5, stated that PDC has a significant positive effects on PIP. The results demonstrated that the PDC has positive effect on PIP. As a result, H5 is supported ($\beta = 0.132$, $t = 3.7$, $p.05$). The hypothesis, H6, stated that RC has a significant positive effects on PIP. The results demonstrated that the RC has positive effect on PIP. As a result, H6 is supported ($\beta = 0.165$, $t = 5.4$, $p.05$). The hypothesis, H7, stated that DC has a significant positive effects on PIP. The results demonstrated that the DC has positive effect on PIP. As a result, H7 is supported ($\beta = 0.473$, $t = 12.9$, $p.05$). The hypothesis, H8, stated that IC has a significant positive effects on PIP. The results demonstrated that the IC has insignificant effect on FP. As a result, H8 is rejected ($\beta = 0.026$, $t = .097$, $p.05$). The hypothesis, H9, stated that PIP has a significant positive effects on FP. The results demonstrated that the PIP has a significant effect on FP. As a result, H9 is supported ($\beta = 0.689$, $t = 37$, $p.05$). The R2 score showed that predictors accounts for 65% of the variation in FP (See Table 4).

MEDIATING RELATIONSHIP

The mediating effect was analyzed via bootstrapping and SEM's technique, followed by Haye's (2009) process. A 95% bootstrapped confidence interval (CI) was produced and exhibited to confirm the mediation effect. Moreover, the mediating hypotheses met the requirement to determine the impact of mediation because they had significant indirect outcomes. The hypotheses H10 stated that, the PIP mediates the interaction among PDC and FP. By observing that the indirect effect of the 95% Boot CI [LL=0.018, UL=0.058] did not intersect a 0 with in center, demonstrate that PIP complementary mediates the link among PDC and FP ($\beta = 0.038$, $t = 3.7$, $p = 0.05$). As a result H10 is supported. The hypotheses H11 stated that, the PIP mediates the interaction among RC and FP. By observing that the indirect effect of the 95% Boot CI [LL=0.029, UL=0.064] did not intersect a 0 with in center, demonstrate that PIP complementary mediates the link among RC and FP ($\beta = 0.046$, $t = 5.1$, $p = 0.05$). As a result H11 is supported. The hypotheses H12 stated that, the PIP mediates the interaction among DC and FP. By observing that the indirect effect of the 95% Boot CI [LL=0.112, UL=0.160] did not intersect a 0 with in center, demonstrate that PIP complementary mediates the link among DC and FP ($\beta = 0.136$, $t = 11.1$, $p = 0.05$). As a result H12 is supported. The hypotheses H13 stated that, the PIP mediates the interaction among IC and FP. By observing that the indirect effect of the 95% Boot CI [LL=-0.007, UL=0.023] intersect a 0 with in center, demonstrate that PIP insignificantly mediates the link among IC and FP ($\beta = 0.008$, $t = .291$, $p = 0.05$). As a result H13 is not supported (see Table 4).

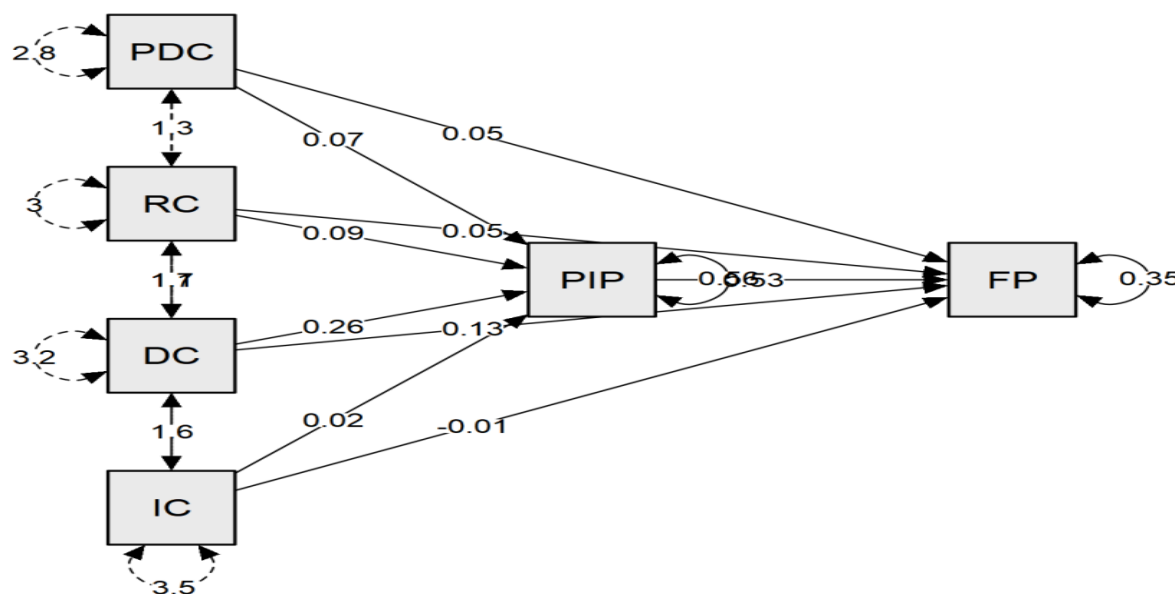


Figure 6: Path-Model

Table 5: Direct and Mediating Effect

Direct-Effect	Beta	SE	T	Sig.	95%CI		Decision
					Lower	Upper	
PDC → FP	0.053	0.015	3.54	.001	0.024	0.083	Accept
RC → FP	0.051	0.013	3.91	.001	0.026	0.077	Accept
DC → FP	0.134	0.017	7.89	.001	0.100	0.167	Accept
IC → FP	-0.006	0.011	-0.53	.596	-0.029	0.016	Reject
PDC → PIP	0.132	0.035	3.77	.001	0.063	0.200	Accept
RC → PIP	0.165	0.030	5.44	.001	0.106	0.225	Accept
DC → PIP	0.473	0.037	12.9	.001	0.402	0.545	Accept
IC → PIP	0.026	0.027	0.97	0.32	-0.026	0.079	Reject
PIP → FP	0.689	0.018	37.6	.001	.426	.789	Accept
Indirect-Effect	Beta	SE	t	Sig.	95%CI		Decision
					Lower	Upper	
PDC → PIP → FP	0.038	0.010	3.75	.001	0.018	0.058	Accept
RC → PIP → FP	0.046	0.009	5.16	.001	0.029	0.064	Accept
DC → PIP → FP	0.136	0.012	11.1	.001	0.112	0.160	Accept
IC → PIP → FP	0.008	.008	1.05	.291	-0.007	0.023	Reject
Total-Effect	Beta	SE	t	Sig.	95%CI		Decision
					Lower	Upper	
PDC → FP	0.092	0.018	5.092	.001	0.056	0.127	Accept
RC → FP	0.098	0.016	6.258	.001	0.067	0.128	Accept
DC → FP	0.269	0.019	14.23	.001	0.232	0.306	Accept
IC → FP	0.002	0.014	0.150	0.881	-0.025	0.029	Reject

Note.CI=Confidence,SE=StandardError

DISCUSSION

The results of the study showed that the costs associated with cybersecurity, specifically PDC, RC, and DC, have a statistically significant effect on e-banking FP, whereas IC has a negative significant influence on the PIP and FP. The findings were consistent with other research (Aral & Weil, 2007; Bose & Luo, 2014), which essentially suggested that businesses should spend on data security in order to better secure their intangible assets, or intellectual and physical assets. The result that was discovered conflicted to (Devaraj & Kohli, 2000; Menon & Lee, 2000).

Secondly, it is found that PDC, RC, and DC, have a statistically significant effect on PIP and e-banking FP, whereas IC has a negative significant influence on the PIP. The findings were consistent with other research (Njoroge & Njero, 2017; Faems et al., 2010), which found that investing in cyber security is a key tactic that contributes to the effectiveness of innovation. This result was divergent to the (Wu, 2012), which suggested that competitive rivalry, high-tech areas may be counteracted, primarily as a result of strong incentives to cope with the rapid pace of innovation advancement and to

reduce the innate difficulties associated with new products and services. It was found that the PIP has a statistically significant effect on e-banking FP. The outcome was consistent with earlier research on (Zu et al., 2019).

Lastly, the PIP partially mediates an association between PDC, RC, DC, and FP, whereas, PIP insignificantly mediates in a relationship amongst IC and e-banking FP. The outcome was partially consistent with earlier research on (Thongsri & Chang, 2019).

CONCLUSION

In order to examine the consequences of the costs related to the adoption of emerging innovations, it is clear that the advent of cutting-edge technology and innovative has improved how banks operate in the present. On the positive note, they have contributed to improving customer services and bolstering the institutions' bottom line. The cost of prevention and detection such as the price of IT insurance had a significant impact on the creation of banking products. Other costs, including direct costs like contingency plans expenses, direct monetary loss, compensatory fees, and legal expenses, as well as indirect costs like customer loss of trust and reputation impact, were major concerns and significant PIP of banks influencer. These expenses cover the necessary actions a financial institution should take in order to compensate for any losses that third parties, such clients, may have endured as a result of cyberattacks.

RECOMMENDATIONS

Banking providers must think about providing cutting-edge technology, which are affordable for both the client and bank activities as bankable commodities become more widespread. It is advised that banks use more cost-effective measures and dependable technology that don't leave openings for illegal actions to occur. Given that banks spend a lot of money producing these items, there must be increased investment in preventive and detection methods. Financial services network operators should think about providing cutting-edge technology that are affordable for both the client and bank operation as banking-related products and services becomes increasingly prevalent. It is advised that the banks adopt more cost-effective measures and dependable technology that do not offer openings for criminal operations to occur. Because banks spend a lot of money producing these items, there ought to be increased investment in preventive and detection methods.

LIMITATIONS AND FUTURE RESEARCH

Due to study's primary focus on self-evaluation measures and some inherent study limitations, there is some worry regarding variation that overstates the relationship among variables. Moreover, the sample is relatively small in terms of gender balance, meaning that fewer female respondents took part in the research. which could raise concerns about how well both genders can be generalize. Third, information about the cross-sectional perspective of time was gathered, which can increase the study's analytical generalizability concerns. Lastly, the technical generalizability problem may be exacerbated by the author's failure to assess all the diagnostics of the various tests performed in the quantitative analysis. In future, the investigator will including some additional moderating and intervening factors and take the data from other companies of Pakistan.

AUTHOR STATEMENT

The authors declare that there is no conflict of interest.

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