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

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Abstract

Purpose of Study: The study objects 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 cybersecurity 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 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 (Solvezmez & 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 in 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 cybersecurity 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 prepared 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 (Njeru & 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 customer satisfaction based on IT theory. The results of the study demonstrated that clients loyalty is positively associated with 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).

H$_{10}$: PIP significantly mediates between the PDC and FP
H$_{11}$: PIP significantly mediates between the RC and FP
H$_{12}$: PIP significantly mediates between the DC and FP
H$_{13}$: PIP significantly mediates between the IC and FP

![Figure 1: Framework](image)
PDC  
RC  
PIP  
DC  
IC  
FP

**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 | Kuala.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  | Akinlosoye–Gbonda (2011) | Australian Jour’l of Bus & Mgt Research | 401 | Sierra Leone |
| 8  | Suleiman et al. (2012) | American Journal of Economics | 251 | Malaysia |
| Study Reference | Journal Title | Country |
|-----------------|---------------|---------|
| 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.Easten |
| 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 Mgt 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 Mkts & Ins | 23 | Zimbabwe |
| 18 | Nabil & Alber (2015) | Int’l Jou’l of Eco and Fin | 14 | Egypt |
| 19 | Belas 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 | Mugarib 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 | Chu 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 | Njorge & 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 | Altohiba 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) | Glb! Jou’l of Mgt, SS & Hum | 11 | Pakistan |
| 33 | Castillo & Falzon (2018) | Review of Eco & Fin | 251 | Malta |
| 34 | Njorge & 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 | Odhiambio & 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

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**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 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.

| 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

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, (Nunally & 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) | 1. Is very high to encounter the banks’ TT 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. Affectsthe 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) | 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) | 1. How how bank performed with respect to sales                      | .827     | .531 | .707| .688|
|                                     | 2. How how bank performed with respect to profit                   | .527     |      |     |     |
|                                     | 3. How how bank performed with respect to market share             | .520     |      |     |     |
|                                     | 4. How how bank performed with respect to return on asset          | .622     |      |     |     |
|                                     | 5. How how bank performed with respect to return on equity         | .742     |      |     |     |
|                                     | 6. How how 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 each construct was estimated to check discriminating validity. The square root of AVE must be higher than the correlation score of all factors, demonstrating no concern of discriminant validity (Henseler et al., 2015). In addition, fit indices find as adequateshown 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
|--------------------------------------|----------|---|----|----|---|
| χ²/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: Comparative-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 ($β = 0.053$, $t=3.5$, $p=0.05$). 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 ($β = 0.051$, $t=3.9$, $p=0.05$). 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 ($β = 0.134$, $t=7.8$, $p=0.05$). 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 ($β = -0.006$, $t=-0.53$, $p=0.05$). 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 ($β = 0.132$, $t=3.7$, $p=0.05$). 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 ($β = 0.165$, $t=5.4$, $p=0.05$). 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 ($β = 0.473$, $t=12.9$, $p=0.05$). The hypothesis, H8, stated that IC has a significant positive effects on PIP. The results demonstrated that the IC has insignificant effect on PIP. As a result, H8 is rejected ($β = 0.026$, $t=-0.97$, $p=0.05$). 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 ($β = 0.689$, $t=37$, $p=0.05$). 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 ($β = 0.038$, $t=3.7$, $p=0.05$). 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 ($β = 0.046$, $t=5.1$, $p=0.05$). 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 ($β = 0.136$, $t=11.1$, $p=0.05$). 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 ($β = 0.008$, $t=2.91$, $p=0.05$). As a result H13 is not supported (see Table 4 ).
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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