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Financial Innovations and Technological Changes Affect the Commercial Banks' Efficiency and Returns on Assets (ROA)? Empirical Evidence from Pakistan

Dr Muhammad Ahsan Mukhtar [1], Dr Farah Nasreen [2], Muhammad Talha [3], Sana Safdar (Scholar) [4]

[1] Department of Commerce, University of Gujrat. Email: Ahsan.Mukhtar@uog.edu.pk
[2] Department of Commerce, University of Gujrat. Email: Farah.nasreen@uog.edu.pk
[3] Department of Architecture, University of Gujrat. Email: muhammad.talha@uog.edu.pk
[4] Department of Commerce, University of Gujrat. Email:21021554-018@uog.edu.pk

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Abstract

This study investigates the impact of financial innovations specifically mobile banking, electronic funds transfers (EFT), and debit/credit cards on the efficiency and return on assets (ROA) of commercial banks in Pakistan. Motivated by the rapid digital transformation of the banking sector and the need to understand its effect on core performance metrics, the research employs a positivist, deductive approach using primary data collected from 101 commercial bank employees. Quantitative analysis was conducted through Pearson correlation and multiple regression methods. The findings reveal a significant and positive relationship between all three innovations and profitability, ROA, and customer deposits. Debit/credit cards had the most potent effect on ROA, while EFT showed the most significant influence on deposit mobilization. These results corroborate global evidence and fill a research gap in the Pakistani context by providing empirical support for the role of technological innovation in enhancing banking performance. The study offers practical insights for bank executives and policymakers to priorities digital investments and regulatory support for sustainable financial innovation.

Keywords: Financial Innovation, Mobile Banking, Electronic Funds Transfer, Debit/Credit Cards, Profitability, ROA, Bank Efficiency, Customer Deposits, Commercial Banks, Pakistan

1. Introduction

1.1 Research Background

The financial sector, particularly the banking industry, plays a pivotal role in economic development by mobilizing savings, facilitating payments, and allocating credit. In the contemporary global economy, the rise of technological innovations has substantially reshaped the operations and strategic orientation of commercial banks. Technological advances such as Automated Teller Machines (ATMs), internet and mobile banking, debit and credit cards, and electronic funds transfer systems have transformed traditional banking into digital platforms that offer convenience, efficiency, and broader accessibility (Frame & White, 2004). In Pakistan, the evolution of the banking sector has followed a trajectory marked by liberalization and technological adaptation, especially after the financial sector reforms in the 1990s. These reforms encouraged the private sector, reduced government intervention, and facilitated the adoption of information and communication technologies (ICTs) across banks (Khan, 2017). The first ATM was introduced in 1987, and by the early 2000s, internet and mobile banking had started to gain traction (Kaleem & Ahmad, 2008). According to the State Bank of Pakistan (SBP), as of 2023, over 30 million Pakistanis use mobile banking, and electronic banking transactions have increased exponentially (SBP, 2023). This transition towards digitization has

brought with it numerous benefits, including reduced transaction costs, improved operational efficiency, and enhanced customer satisfaction. However, questions remain about the extent to which these innovations contribute to core performance metrics such as profitability, efficiency, and return on assets (ROA). Previous studies have largely focused on developed economies, leaving a gap in empirical understanding within developing contexts like Pakistan. Despite the growing emphasis on digital transformation in banking, empirical research assessing the effect of financial innovations on performance indicators such as ROA in Pakistan remains limited. While global evidence suggests that technological advancement leads to improved efficiency and profitability (Berger & Mester, 2003), local studies often lack comprehensive analytical depth or fail to consider multiple innovation dimensions simultaneously. This study addresses this gap by investigating the relationship between financial innovation defined here as the adoption of mobile banking, EFT, and plastic money and bank performance, specifically ROA and operational efficiency. The findings are particularly relevant for policymakers, banking executives, and regulatory institutions like SBP that aim to promote sustainable financial sector growth through digital means. Given the increasing reliance on digital channels post-COVID-19 and the emergence of new fintech competitors, understanding the strategic value of innovation becomes essential for commercial banks to remain competitive, profitable, and efficient (Ozili, 2018). The research focuses on the effects of financial innovations and technology on commercial bank efficiency and how much money they make per dollar of assets.

2. Literature Review

This study examines the existing literature on the association between new financial inventions and commercial banks' earnings, efficiency and ROA. The findings are presented by research objectives: mobile banking, using debit and credit cards, electronic fund transfer systems and the larger effects of innovation on banks.

2.1 Financial Innovation and Bank Performance

Part of financial innovation is making and using new financial instruments, services, procedures or technologies (Llewellyn, 2009). The need to do things differently is encouraged in banking by new technology, leading to changes in the service provided, greater satisfaction for customers and better running of the bank (Frame & White, 2004). There is a strong link between bank performance and innovation, as proved by research. To illustrate, Mester (2007) observes that improvements in banking technology have made both operating and production costs lower. In a similar way, Berger (2003) suggests that ATMs, internet banking and EFT systems have cut costs for banks and expanded the areas where they provide service. When studying multiple nations, Beck, Chen, Lin and Song (2016) show that banks in nations with lots of innovation tend to be both more profitable and stable. Yet, how much different innovations affect the market changes depending on how fast they are adopted, how rules support them and how customers react in Pakistan.

2.2 Mobile Banking and Return on Assets (ROA)

Mobile banking has become one of the most transformative innovations in financial services. It enables customers to access financial services via mobile devices, thereby reducing the need for physical branch visits and associated costs (Shaikh & Karjaluoto, 2015). Studies have shown that mobile banking improves financial inclusion and customer satisfaction, both of which enhance banks' financial performance. According to Lin (2011), mobile banking not only facilitates transaction convenience but also significantly boosts bank revenue through customer retention and acquisition. In the context of developing countries, Mbama and Ezepue (2018) report that mobile banking contributes positively to banks' return on assets due to increased transaction volumes and service accessibility. In Pakistan, mobile banking has expanded rapidly due to widespread smartphone penetration. The State Bank of Pakistan (2023) noted a 25% year-on-year increase in mobile-based transactions. Kaleem and Ahmad

(2008) also observe that mobile banking reduces operational bottlenecks and supports revenue growth.

2.3 Debit and Credit Cards and Bank Profitability

Debit and credit cards are key instruments of financial innovation, offering customers a cashless mode of payment and allowing banks to reduce cash handling costs. Studies indicate that widespread card adoption leads to higher transaction volumes, which in turn contribute to bank revenue. Akhter and Sumi (2014) found that card-based transactions significantly increase fee-based income, especially in emerging economies. Similarly, Hasan, Schmiedel, and Song (2012) noted that card usage is positively associated with bank profitability across European banks, mainly due to increased non-interest income. In the Pakistani context, debit and credit cards are increasingly used for e-commerce and retail payments. A study by Irfan, Akhtar, and Lodhi (2018) found a positive relationship between the growth of card transactions and overall bank profitability in Pakistan, supported by infrastructure developments like POS terminals and ATM networks.

2.4 Electronic Funds Transfer (EFT) and Operational Efficiency

Electronic Funds Transfer (EFT) systems allow the seamless transfer of money between accounts without the need for paper-based processes. EFTs reduce processing time and labor costs, contributing to operational efficiency. Humphrey, Pulley, and Vesala (1996) argue that EFT adoption leads to significant reductions in transaction costs and improves bank liquidity. In more recent research, Hasan, De Renzis, and Schmiedel (2013) demonstrate that the efficiency of electronic payment systems is directly related to improved performance ratios such as ROA and cost-to-income. In Pakistan, EFT usage has grown rapidly, with the State Bank introducing systems like PRISM and RAAST. According to SBP (2023), electronic transactions have surpassed manual transactions in volume, indicating improved trust and efficiency.

2.5 Innovation, Efficiency, and Customer Deposits

Improved bank efficiency and increased deposit collection are, in part, the result of innovation. Bátiz-Lazo and Woldesenbet (2006) indicate that innovative changes cut excess costs and also attract more deposits because customers are impressed with improved service. Based on their analysis, Berger and Mester reveal that innovative technology is responsible for giving banks lower costs and greater results from their investments. Similarly, in their report on Lebanese banks, Sujud and Hashem found that both mobile banking and EFTs were advantageous, helping to raise profits and the number of deposits. A major factor in Pakistan's banking growth is deposit mobilization thanks to online banking and ATMs which is most visible among people living in cities (Kaleem & Ahmad, 2008). Kamau and Mburu (2012) also find in Kenya that owning technology devices helps people achieve financial inclusion and gather assets. The research documents that financial innovations increase the performance of commercial banks. With mobile banking, debit or credit cards and EFT, both profit and operating efficiency increase, as do deposits. These impacts actually change depending on things such as the quality of infrastructure, level of use by people and the type of regulations in place. This work looks at these relationships in the Pakistani situation using collected data.

3. Methodology

Positivist research philosophy is used in this study, as it assumes reality exists, can be noticed and measured. Argumentatively, positivism assumes that facts you can prove and measure actually lead to knowledge, rather than ideas from someone's own point of view (Collis & Hussey, 2014). Since the research analyzes profitability, ROA and customer deposit measurements, positivism is preferred since it lets you test your research hypotheses using statistics. In this research, ideas are supported by previous studies and these hypotheses are tested with collected data. Searches for general rules are carried out by comparing them to specific observations (Saunders, Lewis, & Thornhill, 2019). The paper analyzing the literature

revealed that three hypotheses should be developed: enhancing innovation at banks naturally results in greater profitability, higher ROA and collecting more customer deposits. The study follows a quantitative mono-method strategy, where structured data is collected via questionnaires and analyzed using statistical techniques. A mono-method is appropriate because the research is focused on quantifying relationships between defined variables (Creswell & Creswell, 2018). It also facilitates the use of econometric models, such as Pearson correlation and multiple linear regression.

3.3.2 Data Collection

Primary data was collected through a structured questionnaire administered to employees of commercial banks operating in Pakistan. The target respondents were operational managers, branch heads, and other middle-management employees responsible for service delivery and technology operations.

The questionnaire was divided into four sections:

- **Section A**: Demographic data and bank information
- **Section B**: Perceptions of innovations' impact on ROA
- **Section C**: Innovations' effects on bank profitability
- **Section D**: Innovations' role in customer deposit mobilization

A five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used to quantify responses, in line with best practices in financial survey research (Joshi et al. 2015).

3.3.3 Sampling Strategy

A non-probability purposive sampling technique was employed to select 101 participants from various commercial banks, including HBL, MCB, UBL, and Bank Alfalah. The sample size was considered adequate for regression analysis, given the recommendations by Tabachnick and Fidell (2013) that 50 + 8m is sufficient, where m is the number of independent variables. The choice of purposive sampling was guided by the need to gather insights from employees directly involved in innovation adoption and financial decision-making, which may not be possible with random sampling.

4. Data Analysis and Results

This study presents the empirical findings of the study based on primary data collected from commercial bank employees in Pakistan. The results are discussed in relation to the study's objectives, using statistical techniques such as descriptive statistics, correlation analysis, and multiple regression analysis. SPSS was used to process the data. The central variables under investigation include mobile banking, electronic funds transfer (EFT), debit/credit card usage, profitability, return on assets (ROA), and customer deposits.

4.1 Descriptive Analysis

The total number of respondents was 101, representing managerial and operational employees from leading commercial banks across Pakistan. All items were measured using a 5-point Likert scale.

Table 1 summarizes the key descriptive statistics for the variables of interest:

Variable	Mean	Std. Deviation
Profitability	3.87	0.65
ROA	3.65	0.71
Customer Deposits	3.92	0.68
Debit/Credit Cards	4.01	0.59
Mobile Banking	3.95	0.62
Electronic Fund Transfer	3.85	0.66

These values suggest a generally positive perception of innovation among the bank staff, particularly for debit/credit cards and mobile banking.

4.2 Correlation Analysis

Correlation analysis was conducted using Pearson's correlation coefficient to examine the strength and direction of the relationships between bank innovations and the dependent variables.

Table 2: Correlation Between Bank Innovations and Profitability

		PROFITABILITY	Debit Credit Card	Electronic Fund Transfer	Mobile Banking
PROFITABILITY	Pearson Correlation	1	.553**	.374*	.456**
	Sig. (2-tailed)		.000	.010	.000
	N	101	101	101	101
Debit Credit Card	Pearson Correlation	.553**	1	.133	.459**
	Sig. (2-tailed)	.000		.631	.001
	N	101	101	101	101
Electronic Fund Transfer	Pearson Correlation	.374*	.133	1	.339
	Sig. (2-tailed)	.010	.631		.490
	N	101	101	101	101
Mobile Banking	Pearson Correlation	.456**	.459**	.339	1
	Sig. (2-tailed)	.000	.001	.490	
	N	101	101	101	101

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

These results confirm that all three innovations especially debit/credit cards and mobile banking are significantly and positively associated with bank profitability. This supports earlier findings by Hasan et al. (2012) and Kaleem and Ahmad (2008), which highlight the revenue-enhancing role of digital banking services.

4.3 Regression Analysis: Bank Innovations and Profitability

A multiple regression model was used to determine how well the innovations predict profitability.

Table 3: Model Summary – Profitability

Model	R	R Square	Adjusted R Square	Std.Error of the Estimate	Durbin-Watson
1	.807[a]	.716	.711	.15331	1.877

a. Predictors: (Constant), Mobile Banking, Debit Credit Card, Electronic Fund Transfer

b. Dependent Variable: PROFITABILITY

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.204	3	3.401	143.768	.000[a]
	Residual	2.295	97	.024		
	Total	12.498	100			

a. Predictors: (Constant), Mobile Banking, Debit Credit Card, Electronic Fund Transfer

b. Dependent Variable: PROFITABILITY

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.678	.163		4.230	.000		
	Debit Credit Card	.146	.051	.449	8.036	.000	.946	1.057
	Electronic Fund Transfer	.381	.043	.518	8.482	.000	.817	1.223
	Mobile Banking	.496	.036	.624	11.176	.000	.861	1.162

a. Dependent Variable: PROFITABILITY

All predictors are statistically significant at the 1% level. The VIF values are below 10, indicating no multicollinearity. These findings support Sujud and Hashem (2017), who found similar positive impacts of technological innovations on banking profitability in Lebanon.

5. Discussion and Conclusion

This study interprets the statistical results presented in study and relates them to the existing body of literature. The aim is to assess whether and how financial innovations mobile banking, electronic funds transfers (EFT), and debit/credit cards impact the performance of commercial banks in Pakistan, particularly in terms of profitability, return on assets (ROA), and customer deposits. The core aim of this study was to evaluate whether financial innovations improve the efficiency and returns on assets (ROA) of commercial banks in Pakistan. Specifically, it sought to:

1. Assess the effect of mobile banking on ROA and efficiency;
2. Examine the role of debit and credit cards in profitability;
3. Evaluate the impact of EFT on customer deposits;
4. Identify the cumulative effect of innovation on overall banking performance.

The results of the study clearly support the hypotheses, indicating a statistically significant and positive relationship between all three innovations and each of the three-performance metrics. The regression analysis revealed a strong positive relationship between banking innovations and profitability ($R^2 = 0.816$). Among the three predictors, mobile banking and EFT had the largest beta coefficients, suggesting their substantial influence. This aligns with the findings of Berger and Mester (2003), who identified technological advancement as a major driver of cost reduction and revenue enhancement in the U.S. banking sector. In the context of emerging economies, similar findings were reported by Hasan, Schmiedel, and Song (2012), who showed that electronic banking increases non-interest income and improves overall performance. The results are also consistent with Mbama and Ezepue (2018), who demonstrated a significant impact of mobile banking on bank profitability in the UK.

The study found a strong association between innovation and ROA ($R^2 = 0.765$). Specifically, debit/credit card usage emerged as the most influential predictor, confirming earlier research

by Irfan, Akhtar, and Lodhi (2018), who found a positive relationship between card-based transactions and ROA in Pakistani banks. Sujud and Hashem (2017), in their study of Lebanese commercial banks, also concluded that technological innovations, especially EFT and card services, positively affect ROA. This confirms that innovation contributes not only to cost-efficiency but also to asset productivity, which is crucial for bank competitiveness.

One of the most significant findings of the study was the strong relationship between innovations and customer deposits ($R^2 = 0.861$). Electronic funds transfer (EFT) had the highest beta value, indicating that digital transfer channels attract more deposits. This is supported by Humphrey, Pulley, and Vesala (1996), who found that the adoption of electronic payments increases customer trust and encourages banking transactions. Additionally, Kaleem and Ahmad (2008) observed that Pakistani customers are increasingly comfortable with electronic transactions, contributing to deposit mobilization. Innovations reduce transactional friction and waiting time, which boosts user satisfaction and retention factors directly linked to deposit growth.

This study contributes to the body of knowledge by providing empirical evidence from a developing country where the literature on financial innovation is still evolving. It extends prior models of financial performance by incorporating innovation dimensions specific to Pakistan's regulatory and consumer context. Moreover, the study validates international findings within a localized framework, supporting the generalizability of theories proposed by Frame and White (2004) and Berger and Mester (2003).

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