Impact of Digitalization on Financial Performance of Commercial Banks in Nepal

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Abstract

The study examines the effect of digitalization on the financial performance of Nepalese commercial banks. Return on assets and return on equity are selected as the dependent variables. The selected independent variables are DD/TT/SWIFT fees income, credit card/ ATM issuance fees income, DD/TT/SWIFT fees expenses, VISA card and master card fees expenses, number of ATMs, and bank size. The study is based on secondary data of 13 commercial banks with 104 observations for the study period from 2015/16 to 2022/23. The data were collected from Banking and Financial Statistics published by Nepal Rastra Bank, publications and websites of Nepal Rastra Bank (NRB) and annual reports of the selected commercial banks. The correlation coefficients and regression models are estimated to test the significance and importance of digitalization on the financial performance of Nepalese commercial banks.

The study showed that Credit Card/ATM issuance fees income has a negative impact on return on assets. It means that increase in Credit Card/ATM issuance fees income leads to decrease in return on assets. Similarly, number of ATMs has a positive impact on return on equity. It means that increase in number of ATMs leads to increase in return on equity. Likewise, Credit Card/ATM issuance fees income has a positive impact on return on equity. It means that increase in Credit Card/ATM issuance fees income leads to increase in return on equity. In addition, DD/TT/SWIFT fees expenses have a negative impact on return on assets. It means that increase in DD/TT/SWIFT fees expenses leads to decrease in return on assets. Moreover, VISA Card and Master Card fees expenses has a negative impact on return on assets. It means that increase in VISA Card and Master Card fees expenses leads to decrease in return on assets. Further, DD/TT/SWIFT fees expenses have a negative impact on return on assets. It means that increase in DD/TT/SWIFT fees expenses leads to decrease in return on assets. Similarly, bank size has a positive impact on return on assets. It means that increase in bank size leads to increase in return on assets.

Keywords: return on assets, return on equity, fees income, credit card, fees expenses, VISA card and master card fees expenses, number of ATMs, bank size

1. Introduction

Digital innovations play a significant role in improving the efficiency of the banking sector as well as reducing the costs of banking transactions for customers. Digital innovation has a direct influence on performance

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improvements. An organization that is competing in fast-changing markets with fast-changing technology must innovate themselves otherwise it will be overtaken by competitors. The increased adoption and penetration of the internet have added a new distribution channel to retail banking. E-banking is driven largely by the prospects of operating cost minimization and operating revenue maximization (Al-Dmour *et al.,* 2021). Digital innovation is recognized as one of the key factors on the firms' competitive advantage as well as a critical element in improving the economic and financial results of firms (Lee *et al.,* 2021). Digital innovations allow banks to automate various processes, such as account opening, loan processing, and transaction reconciliations. Automation reduces the need for manual intervention, leading to faster turnaround times, fewer errors, and lower operational costs. The advent of online and mobile banking platforms enables customers to access banking services conveniently from anywhere at any time. This reduces the need for physical branches, leading to cost savings for banks in terms of real estate, staffing, and other overhead expenses (Ameme and Wireko, 2016). Banks are increasingly partnering with fintech companies to leverage their innovative solutions for various banking activities, such as lending, risk management, and customer engagement. Fintech collaborations enable banks to offer more competitive products and services while reducing development costs (Shermukhamedov and Tulaganova, 2021). According to Bueno et al. (2024), digital innovations allow banks to collect and analyze vast amounts of data to gain insights into customer behavior, preferences, and risks. By leveraging data analytics, banks can personalize their offerings, target marketing efforts more effectively, and mitigate risks, leading to improved operational efficiency and reduced costs. Overall, digital innovations have revolutionized the banking sector by driving operational efficiency, reducing costs, enhancing customer experience, and fostering innovation. As technology continues to evolve, banks must continue to embrace digital transformation to stay competitive and meet the evolving needs of their customers.

Innovation is an essential component of competitiveness. The banking sector has undergone dramatic change since the emergence of new technology such as internet and the concept of various kinds of banking services are developed. A growing interest has been observed from past few years in both the academic and business communities in understanding the relationship between innovation and company performance. Chesbrough (2003) defined innovation as a process involving equipping in new, improved capabilities or increased utility. It is widely recognized that innovation is key to the economic performance of firms. Innovative firms grow faster in terms of employment and

profitability. Innovation enables firm to achieve higher financial performance by offering a greater variety of valuable, rare, imitable and differentiated products (Zahra *et al.,* 2000). Al-Dmour *et al.* (2021) claimed that digital innovations play a significant role in improving the efficiency of the banking sector as well as reducing the costs of banking transactions for customers. Digital innovation has a direct influence on performance improvements. An organization which is competing in fast changing markets with fast changing technology must make things happen, it must innovate otherwise it will be overtaken by competitors. The increased adoption and penetration of Internet has added a new distribution channel to retail banking. E-banking is driven largely by the prospects of operating costs minimization and operating revenues maximization.

In today's commercial banking environment information technology, effective service delivery and customer satisfaction are an indispensable competitive strategy. Furthermore, the stiff competition has forced banks to set up and put into effect all necessary decision support digital systems. This enables them to dynamically plan new locations, evaluate their performance, forecast customers' attitudes to new offered products and services, estimate clients' switching behavior, and finally provide marketing support to their geographically separate branches. Rane et al. (2023) asserted that innovations provide firms with a strategic orientation to overcome the problems encounters and to attain sustainable competitive advantage. Digital tools and technologies streamline banking operations, leading to faster turnaround times, fewer errors, and enhanced operational efficiency. By optimizing processes such as account opening, loan processing, and transaction handling, banks can serve customers more effectively while reducing costs and increasing productivity (Tran and Corner, 2016). Digital channels such as online banking, mobile apps, and social media platforms allow banks to reach a broader customer base, including those in remote or underserved areas. This expanded reach enables banks to acquire new customers and grow their market share without significant investments in physical infrastructure (Wewege et al., 2020). According to Singh and Srivastava (2020), digital transformation enables banks to offer personalized, convenient, and seamless experiences to their customers. Features such as 24/7 access to banking services, personalized recommendations, and instant support through chatbots improve customer satisfaction and loyalty, ultimately leading to higher revenues and profitability. Hussien and Abd El Aziz (2013) stated that rapid growth in the e-banking services has led to increased access for the less privileged and disadvantage population to affordable financial services not only within but also across the

borders. The integration of banking technologies with mobile technologies that have much wider penetration hold new promise of financial inclusion for the mass. Al-Khatib (2022) stated that e banking transactions have increased at a rapid place for the success of financial inclusion. Thus, the rapid growth of e-banking services user has made an important platform for extending banking services. The affordability of e-banking services means e-banking services is a useful avenue towards increased financial inclusion, making it is important in countries where financial inclusion is high or where people are informally served.

Arnaboldi and Claeys (2008) showed that Internet Banking influences more to the performance of the bank when compared to traditional branch banking and improve competition in this sector. Internet banking allows banks to serve customers remotely, reducing the need for physical branches and associated costs such as rent, utilities, and staff. This cost efficiency enables banks to offer competitive interest rates, lower fees, and better terms to customers, ultimately improving profitability. Internet banking breaks geographical barriers, enabling banks to reach customers beyond their traditional branch networks. Customers can access banking services anytime, anywhere, leading to increased customer acquisition and retention rates. Maduku (2013) revealed that internet banking platforms collect vast amounts of data on customer transactions, behaviors, and preferences. Banks can leverage this data to personalize marketing efforts, offer tailored product recommendations, and cross-sell additional services, thereby increasing customer engagement and revenue generation. Internet banking streamlines and automates various banking processes, reducing manual errors and processing times. This operational efficiency allows banks to handle a higher volume of transactions with fewer resources, leading to cost savings and improved profitability. Internet banking lowers the barrier to entry for new players in the banking sector, including digital-only banks and fintech startups. These innovative entrants leverage technology to offer niche banking services, challenge traditional incumbents, and drive competition, ultimately benefiting consumers through better offerings and pricing.

In the context of Nepal, Lama (2020) examined the impact of information technology on the organizational performance of Nepalese commercial banks. The study showed that automated teller machine, online/ internet payment, mobile banking, point of sale and electronic fund transfer have positive impact on organizational performance. The study concludes that better use of information technology has significant impact on the organizational

performance. The study also concludes that electronic fund transfer followed by the mobile banking is the most influencing factor that explains the changes in organizational performance of Nepalese commercial banks. Bangshi et al. (2022) assessed the impact of technology adoption on operational efficiency in Nepalese commercial banks. The study showed that debit card, credit card, internet banking, mobile banking and point of sale have positive impact on net profit margin. However, the study showed that debit card, credit card, internet banking, mobile banking and point of sale have negative on operating expenses ratio. The study concluded that technology adoption plays vital role in enhancing the operational efficiency in Nepalese commercial banks. The study also concluded that internet banking followed by mobile banking are the most influencing factors that explain the net profit margin in the context of Nepalese commercial banks. Similarly, Banstola (2007) concluded that there is positive relationship between e-banking and bank performance.

The above discussion shows that empirical evidences vary greatly across the studies on the impact of digitalization on financial performance of commercial banks. Though there are above mentioned empirical evidences in the context of other countries and in Nepal, no such findings using more recent data exist in the context of Nepal. Therefore, in order to support one view or the other, this study has been conducted.

The main purpose of the study is to determine the impact of digitalization on financial performance of Nepalese commercial banks. Specifically, it examines the relationship of DD/TT/SWIFT fees income, credit card/ ATM issuance fees income, DD/TT/SWIFT fees expenses, VISA card and master card fees expenses, number of ATMs, and bank size on return on assets and return on equity of Nepalese commercial banks.

The remainder of this study is organized as follows. Section two describes the sample, data and methodology. Section three presents the empirical results and the final sections draws conclusion.

2. Methodological aspects

The study is based on the secondary data which were gathered from 13 Nepalese commercial banks from 2015/16 to 2022/23, leading to a total of 104 observations. The study employed convenience sampling method. The main sources of data include Banking and Financial Statistics published by Nepal Rastra Bank and annual report of respective commercial banks. This study is based on descriptive as well as causal comparative research designs. Table 1 shows the list of commercial banks selected for the study along with

the study period and number of observations.

Table 1

List of commercial banks selected for the study along with study period and number of observations

S. N.	Name of commercial banks	Study period	Observations
1	Prime Commercial Bank Limited	2015/16-2022/23	8
2	Rastriya Banijya Bank Limited	2015/16-2022/23	8
3	Standard Chartered Bank Nepal Limited	2015/16-2022/23	8
4	Everest Bank Limited	2015/16-2022/23	8
5	Himalayan Bank Limited	2015/16-2022/23	8
6	NMB Bank Limited	2015/16-2022/23	8
7	Agricultural Development Bank Limited	2015/16-2022/23	8
8	Sanima Bank Limited	2015/16-2022/23	8
9	Siddhartha Bank Limited	2015/16-2022/23	8
10	Nepal SBI Bank Limited	2015/16-2022/23	8
11	Machhapuchchhre Bank Limited	2015/16-2022/23	8
12	Citizens Bank International Limited	2015/16-2022/23	8
13	Nepal Bank Limited	2015/16-2022/23	8
Total number of observations			**104**

Thus, the study is based on the 104 observations.

The model

The model used in this study assumes that bank performance depends on digitalization. The dependent variables selected for the study are return on assets and return on equity. Similarly, the selected independent variables in this study are DD/TT/SWIFT fees income, credit card/ ATM issuance fees income, DD/TT/SWIFT fees expenses, VISA card and master card fees expenses, number of ATMs, and bank size. Therefore, the models take the following forms:

$$ROA = \beta_0 + \beta_1 NOA + \beta_2 DTSI + \beta_3 CAI + \beta_4 DTSE + \beta_5 VME + \beta_6 BS + e_{it}$$

$$ROE = \beta_0 + \beta_1 NOA + \beta_2 DTSI + \beta_3 CAI + \beta_4 DTSE + \beta_5 VME + \beta_6 BS + e_{it}$$

Where,

ROA = Return on assets as measured by the ratio of net profit to total assets, in percentage.

ROE = Return on equity as measured by the ratio of net income to shareholder's equity, in percentage.

DTSI = DD/TT/SWIFT fees income as measured by the total income from direct debit, telegraphic transfer and swift fees made by bank, Rs. in million.

CAI = Credit Card/ ATM issuance fees income as measured by the total income of both credit card and ATM issuance fees made by bank, Rs. in million.

DTSE = DD/TT/SWIFT fees expenses as measured by the total expenditure of direct debit, telegraphic transfer and swift fees made by bank, Rs. in million.

VME = VISA Card and Master Card fees expenses as measured by the total expenditure of Visa card and Master Card made by bank, Rs. in million.

NOA = Number of ATMs as measured by the total number of ATM outlets available in bank, in numbers.

BS = Bank size measured by the total number of branches available in bank, in numbers.

The following section describes the independent variables used in this study along with hypothesis formulation.

Number of ATMs

Automated Teller Machines (ATMs) are electronic banking machines that enable customers to perform various financial transactions without the need for human assistance. These transactions typically include cash withdrawals, deposits, balance inquiries, fund transfers, and bill payments. Gichungu and Oloko (2015) assessed the relationship between bank innovations and financial performance of commercial banks in Kenya. the study found that there is a positive relationship between bank innovations and financial performance of commercial banks. Moreover, the study also showed that increasing the number of ATMs can enhance customer convenience, making it easier for them to access banking services. This convenience can lead to higher customer satisfaction and retention, potentially increasing the bank's customer base and overall revenue. Le and Ngo (2020) concluded that the number of bank cards issued, the number of automated teller machines (ATMs), and the number of points of sale (POS) terminals can improve bank profitability. Furthermore, Harelimana (2018) explored the Automated teller machines (ATM) and profitability of commercial bank from 2010 to 2016 with the aim of assessing the use of ATM and its contribution to the profitability in bank of Kigali. The findings revealed there is a significant

positive relationship between automated teller machines and profitability of Bank of Kigali. Based on it, this study develops the following hypothesis.

$H_{1:}$ There is a positive relationship between the number of ATMs and bank financial performance.

DD/TT/SWIFT fees income

Direct Debit (DD), Telegraphic Transfer (TT), and SWIFT are core mechanisms for international money transfers, each generating fee income for banks. Scott and Reenen (2018) revealed that SWIFT has a favorable impact on the profitability of banks, indicating that the adoption of SWIFT contributes positively to banks' financial performance. Scott *et al.* (2017) noted that SWIFT exerts significant and enduring effects on bank profitability, particularly highlighting its amplified impact on the profitability of small banks compared to larger ones over the long term. Thakur *et al.* (2023) concluded that Information and Communication Technology (ICT), encompassing Direct Debit (DD), Telegraphic Transfer (TT), and SWIFT, adversely affects banks' profitability. On the other hand, Niepmann and Schmidt-Eisenlohr (2020) identified a positive correlation between electronic payments and bank profitability, suggesting that the adoption and utilization of electronic payment systems contribute positively to banks' financial performance. In a related study, Ozili (2018) concluded that higher SWIFT issuance fees are associated with increased bank profitability, suggesting that the fees charged for SWIFT services contribute positively to banks' financial performance. Based on it, this study develops the following hypothesis.

H_2: There is a positive relationship between the DD/TT/SWIFT Fees Income and bank financial performance.

Credit Card/ ATM issuance fees income

Credit card and ATM issuance fees income represent a significant revenue stream for financial institutions. These fees are charged to customers for the issuance of credit cards and ATM cards, as well as for associated services such as card replacements and PIN re-issuance. The income generated from these fees contributes to the overall profitability of banks and other financial service providers (Massoud et al., 2006). Aduda and Kingoo (2017) found a positive correlation between credit card revenue, including issuance fees, and bank profitability, indicating that revenue generated from credit card operations contributes positively to the financial performance of banks. Agarwal and Hauswald (2010) concluded that increased competition

in the banking sector may lead to downward pressure on credit card issuance fees, potentially affecting bank profitability. Njoroge and Mugambi (2018) observed that higher ATM prices are associated with greater bank profits, albeit possibly at the expense of reduced consumer welfare. Based on it, this study develops the following hypothesis.

H_3: There is a positive relationship between the Credit card and ATM issuance fees income and bank financial performance.

DD/TT/SWIFT fees expenses

Direct Debit (DD), Telegraphic Transfer (TT), and SWIFT are essential tools for facilitating international money transfers, with each serving as a revenue source for banks. In a competitive market, banks may face pressure to keep fees low to attract and retain customers. However, reducing fees may lead to lower revenue from transaction services, impacting the bank's financial performance. Conversely, if a bank increases fees to improve profitability, it may risk losing customers to competitors with lower fees (Cull et al., 2007). According to Wangui and Nzuki (2021), excessive fees can lead to dissatisfaction among customers, potentially causing them to switch to other banks or seek alternative payment methods. This can result in loss of revenue and market share for the bank, negatively affecting its financial performance in the long term. Moreover, Mueni and Atheru (2019) revealed that high DD, TT, and SWIFT fees expenses may indicate inefficiencies in the bank's operations, such as outdated systems, manual processes, or lack of automation. Addressing these inefficiencies can help reduce costs and improve overall financial performance. Based on it, this study develops the following hypothesis:

H_4: There is a negative relationship between the DD/TT/SWIFT fees expenses and bank financial performance.

VISA Card and Master Card fees expenses

Expenses related to VISA and Mastercard fees expenses encompass the charges incurred by merchants for accepting transactions made with these payment networks. These fees typically include interchange fees, assessment fees, and processing fees, which are paid by merchants to banks and payment processors for facilitating card transactions. Banks incur fees when processing transactions made with Visa and Mastercard credit and debit cards. These fees, known as interchange fees, are paid to the card networks (Visa and Mastercard) and can represent a significant expense for banks, particularly for

high-volume card issuers. Higher expenses in this area can reduce the bank's profitability (Shy and Wang, 2011). In a competitive market, banks may face pressure to offer competitive rates and terms to merchants to attract more card transactions. However, negotiating lower interchange fees with card networks like Visa and Mastercard can be challenging, especially for smaller banks. As a result, banks may have limited control over these fees, impacting their financial performance (Rochet and Wright, 2010). Schmalensee (2002) noted a negative relationship between interchange fees and bank profitability, indicating that higher interchange fees may negatively impact bank financial performance. Based on it, this study develops the following hypothesis.

H_5: There is a negative relationship between the VISA and Mastercard fees expenses and bank financial performance.

Bank size

The size of a bank, often measured by total numbers of branches plays a pivotal role in shaping its operational dynamics, financial performance, and overall impact on the financial system. Abisola (2022) examined the nexus between bank size and financial performance. The results showed that larger banks often benefit from economies of scale, which means that the average cost per unit of output decreases as the scale of operations increases. This can result in lower costs relative to smaller banks, leading to higher profitability. Likewise, AlFadhli and AlAli (2021) assessed the effect of bank size on financial performance: a case study on Kuwaiti Banks. The study showed that larger banks typically have more diverse revenue streams and a broader range of products and services. This diversification can help mitigate risks associated with specific sectors or economic conditions, leading to more stable financial performance. Similarly, Muhindi and Ngaba (2018) supported the notion that larger banks tend to have higher profitability. Moreover, Bebeji et al. (2015) revealed that larger banks typically have greater financial resources to invest in technological advancements and innovation. This can lead to the development of more efficient processes, better customer experiences, and new revenue-generating opportunities, ultimately driving financial performance. Based on it, this study develops the following hypothesis.

H_6: There is a positive relationship between the bank size and its financial performance.

3. Results and discussion

Descriptive statistics

Table 2 presents the descriptive statistics of the selected dependent and independent variables during the period 2015/16 to 2022/23.

Table 2

Descriptive statistics

This table shows the descriptive statistics of dependent and independent variables of 13 Nepalese commercial banks for the study period from 2015/16 to 2022/23. The dependent variables are ROA (Return on assets as measured by the ratio of net profit to total assets, in percentage) and ROE (Return on equity as measured by the ratio of net income to shareholder's equity, in percentage). The independent variables are DTSI (DD/TT/SWIFT fees income as measured by the total income from direct debit, telegraphic transfer and swift fees made by bank, Rs. in million), CAI (Credit Card/ ATM issuance fees income as measured by the total income of both credit card and ATM issuance fees made by bank, Rs. in million), DTSE (DD/ TT/SWIFT fees expenses as measured by the total expenditure of direct debit, telegraphic transfer and swift fees made by bank, Rs. in million), VME (VISA Card and Master Card fees expenses as measured by the total expenditure of Visa card and Master Card made by bank, Rs. in million), and NOA (Number of ATMs as measured by the total number of ATM outlets available in bank, in numbers).

Variables	Minimum	Maximum	Mean	Std. Deviation
NOA	23.00	264.00	117.81	56.08
DTSI	691641.00	48509899.00	18537102.16	9998402.19
CAI	23.00	373059083.00	91257624.81	76672147.06
DTSE	134844.00	14011716.00	6395855.35	3192856.31
VME	2708.00	178739988.00	43220292.09	37899073.62
BS	12.00	293.00	133.46	75.22
ROE	4.08	23.20	13.62	4.24
ROA	0.47	2.77	1.54	0.43

Source: SPSS version 22

Correlation analysis

Having indicated the descriptive statistics, Pearson's correlation coefficients are computed and results are presented in Table 3.

Table 3

Pearson's correlation coefficients matrix

This table shows the bivariate Pearson's correlation coefficient matrix of dependent and independent variables of 13 Nepalese commercial banks for the study period from 2015/16

to 2022/23. The dependent variables are ROA (Return on assets as measured by the ratio of net profit to total assets, in percentage) and ROE (Return on equity as measured by the ratio of net income to shareholder's equity, in percentage). The independent variables are DTSI (DD/TT/SWIFT fees income as measured by the total income from direct debit, telegraphic transfer and swift fees made by bank, Rs. in million), CAI (Credit Card/ ATM issuance fees income as measured by the total income of both credit card and ATM issuance fees made by bank, Rs. in million), DTSE (DD/TT/SWIFT fees expenses as measured by the total expenditure of direct debit, telegraphic transfer and swift fees made by bank, Rs. in million), VME (VISA Card and Master Card fees expenses as measured by the total expenditure of Visa card and Master Card made by bank, Rs. in million), and NOA (Number of ATMs as measured by the total number of ATM outlets available in bank, in numbers).

Variables	NOA	DTSI	CAI	DTSE	VME	BS	ROE	ROA
NOA	1							
DTSI	0.212*	1						
CAI	0.116	0.193	1					
DTSE	0.381**	0.427**	0.096	1				
VME	0.318**	0.336**	0.802**	0.619**	1			
BS	0.553**	-0.063	-0.150	0.188	-0.058	1		
ROE	0.289**	-0.002	0.225*	0.027	0.057	-0.141	1	
ROA	-0.340**	-0.138	-0.133	-0.087	-0.345**	-0.096	0.081	1

Note: The asterisk signs (**) and (*) indicate that the results are significant at one percent and five percent levels respectively.

Table 3 shows that number of ATMs has a negative relationship with return on assets. It means that increase in number of ATMs leads to decrease in return on assets. Similarly, DD/TT/SWIFT fees income has a negative relationship with return on assets. It means that increase in DD/TT/SWIFT Fees Income leads to decrease in return on assets. Moreover, Credit Card/ ATM Issuance fees income has a negative relationship with return on assets. It means that increase in Credit Card/ATM issuance fees income leads to decrease in return on assets. Likewise, DD/TT/SWIFT fees expenses have a negative relationship with return on assets. It means that increase in DD/ TT/SWIFT fees expenses leads to decrease in return on assets. In addition, VISA Card and Master Card fees expenses has a negative relationship with return on assets. It means that increase in VISA Card and Master Card fees expenses leads to decrease in return on assets. Moreover, DD/TT/SWIFT fees expenses have a negative relationship with return on assets. It means that increase in DD/TT/SWIFT fees expenses leads to decrease in return on assets. Similarly, bank size has a positive relationship with return on assets. It means that increase in bank size leads to increase in return on assets.

Similarly, number of ATMs has a positive relationship with return on

equity. It means that increase in number of ATMs leads to increase in return on equity. Similarly, DD/TT/SWIFT fees income has a negative relationship with return on equity. It means that increase in DD/TT/SWIFT fees income leads to decrease in return on equity. Moreover, Credit Card/ATM issuance fees income has a positive relationship with return on equity. It means that increase in Credit Card/ATM issuance fees income leads to increase in return on equity. Likewise, DD/TT/SWIFT fees expenses have a positive relationship with return on equity. It means that increase in DD/TT/SWIFT fees expenses leads to increase in return on equity. In addition, VISA Card and Master Card fees expenses has a positive relationship with return on equity. It means that increase in VISA Card and Master Card fees expenses leads to increase in return on equity. Furthere, DD/TT/SWIFT fees expenses have a positive relationship with return on equity. It means that increase in DD/TT/SWIFT fees expenses leads to increase in return on equity. Similarly, bank size has a negative relationship with return on equity. It means that increase in bank size leads to decrease in return on equity.

Regression analysis

Having indicated the Pearson's correlation coefficients, the regression analysis has been carried out and the results are presented in Table 4 and Table 5. More specifically, Table 4 shows the regression results of DD/TT/SWIFT fees income, credit card/ ATM issuance fees income, DD/TT/SWIFT fees expenses, VISA card and master card fees expenses, number of ATMs, and bank size on return on assets of Nepalese commercial banks.

Table 4

Estimated regression results of DD/TT/SWIFT fees income, credit card/ ATM issuance fees income, DD/TT/SWIFT fees expenses, VISA card and master card fees expenses, number of ATMs, and bank size on return on assets

The results are based on panel data of 13 commercial banks with 104 observations for the period from 2015/16 to 2022/23 by using the linear regression model and the model is ROA $= \beta_0 + \beta_1$ DTSI $+ \beta_2$ CAI $+ \beta_3$ DTSE $+ \beta_4$ VME $+ \beta_5$ NOA $+ \beta_6$ BS $+ e_{it}$ where the dependent variable is ROA (Return on assets as measured by the ratio of net profit to total assets, in percentage). The independent variables are DTSI (DD/TT/SWIFT fees income as measured by the total income from direct debit, telegraphic transfer and swift fees made by bank, Rs. in million), CAI (Credit Card/ ATM issuance fees income as measured by the total income of both credit card and ATM issuance fees made by bank, Rs. in million), DTSE (DD/TT/SWIFT fees expenses as measured by the total expenditure of direct debit, telegraphic transfer and swift fees made by bank, Rs. in million), VME (VISA Card and Master Card fees expenses as measured by the total expenditure of Visa card and Master Card made by bank, Rs. in million), and NOA (Number of ATMs as measured by the total number of ATM

outlets available in bank, in numbers).

Model	Intercept	Regression coefficients of						Adj. R_bar^2	SEE	F-value
		NOA	DTSI	CAI	DTSE	VME	BS			
1	-1.859 (19.577)**	-0.003 (3.649)**						0.107	0.414	13.314
2	2.831 (3.098)**		-0.078 (1.408)					0.009	0.436	1.982
3	1.955 (6.415)**			-0.023 (1.356)				0.008	0.436	1.838
4	3.54 (3.920)**				-0.127 (2.172)*			0.041	0.434	4.716
5	3.159 (6.983)**					-0.095 (0.345)		0.110	0.417	12.691
6	1.62 (18.424)**						0.001 (0.974)	0.010	0.438	0.948
7	1.823 (18.343)**	-0.003 (3.704)**					0.001 (1.190)	0.110	0.413	7.392
8	2.973 (3.225)**		-0.066 (1.170)	-0.019 (1.107)				0.012	0.436	1.606
9	3.683 (3.142)**		-0.125 (1.661)		-0.002 (0.034)			0.016	0.440	1.716
10	3.007 (6.784)**	-0.002 (2.582)**				-0.072 (2.655)**		0.160	0.405	10.061

Notes:

i. Figures in parenthesis are t-values.
ii. The asterisk signs (**) and (*) indicate that the results are significant at one percent and five percent level respectively.
iii. Return on asset is the dependent variable.

Table 4 shows that the beta coefficients for number of ATMs are negative with return on assets. It indicates that number of ATMs has a negative impact on return on assets. This finding is consistent with the findings of Harelimana (2018). Similarly, the beta coefficients for DD/TT/SWIFT fees income are negative with return on assets. It indicates that DD/TT/SWIFT fees income has a negative impact on return on assets. This finding is similar to the findings of Niepmann and Schmidt-Eisenlohr (2020). In contrast, the beta coefficient for Credit Card/ ATM issuance fees income are negative with return on assets. It indicates that Credit Card/ ATM Issuance fees income has a negative impact on return on assets. This finding contradicts with the findings of Agarwal and Hauswald (2010). Moreover, the beta coefficients for DD/TT/SWIFT fees expenses are negative with return on assets. It indicates that DD/TT/ SWIFT fees expenses have a negative impact on return on assets. This finding is similar to the findings of Wangui and Nzuki (2021). Likewise, the beta coefficients for VISA Card and Master Card fees expenses are negative with return on assets. It indicates that VISA Card and Master Card fees expenses has a negative impact on return on assets. This finding is consistent with the findings of Shy and Wang (2011). Moreover, the beta coefficients for bank size are positive with return on assets. It indicates that bank size has a positive impact on return on assets. This finding is similar to the findings of Muhindi

and Ngaba (2018).

Table 5 shows the regression results of DD/TT/SWIFT fees income, credit card/ ATM issuance fees income, DD/TT/SWIFT fees expenses, VISA card and master card fees expenses, number of ATMs, and bank size on return on equity of Nepalese commercial banks.

Table 5

Estimated regression results of DD/TT/SWIFT fees income, credit card/ ATM issuance fees income, DD/TT/SWIFT fees expenses, VISA card and master card fees expenses, number of ATMs, and bank size on return on equity

The results are based on panel data of 13 commercial banks with 104 observations for the period from 2015/16 to 2022/23 by using the linear regression model and the model is ROE = $\beta_0 + \beta_1$ DTSI + β_2 CAI + β_3 DTSE + β_4 VME + β_5 NOA + β_6 BS + e_{it} where the dependent variable ROE (Return on equity as measured by the ratio of net income to shareholder's equity, in percentage). The independent variables are DTSI (DD/TT/SWIFT fees income as measured by the total income from direct debit, telegraphic transfer and swift fees made by bank, Rs. in million), CAI (Credit Card/ ATM issuance fees income as measured by the total income of both credit card and ATM issuance fees made by bank, Rs. in million), DTSE (DD/TT/SWIFT fees expenses as measured by the total expenditure of direct debit, telegraphic transfer and swift fees made by bank, Rs. in million), VME (VISA Card and Master Card fees expenses as measured by the total expenditure of Visa card and Master Card made by bank, Rs. in million), and NOA (Number of ATMs as measured by the total number of ATM outlets available in bank, in numbers).

Model	Intercept	Regression coefficients of						Adj. R_bar^2	SEE	F-value
		NOA	DTSI	CAI	DTSE	VME	BS			
1	11.044 (11.801)**	0.022 (3.052)**						0.075	4.086	9.316
2	13.001 (1.458)		-0.038 (0.07)					0.010	4.268	0.005
3	6.916 (2.384)*			0.385 (2.336)*				0.041	4.159	5.459
4	11.863 (1.471)				0.075 (0.016)			0.011	3.878	0.063
5	11.541 (2.56)*					0.083 (0.032)		0.010	4.158	0.306
6	14.688 (17.338)**						-0.008 (1.438)	0.014	4.226	2.067
7	7.288 (1.048)			0.308 (1.988)*	0.027 (0.064)			0.023	3.813	2.008
8	12.172 (13.326)**	0.04 (5.001)**					-0.024 (4.098)**	0.199	3.802	13.775
9	12.524 (1.402)		-0.276 (0.513)	0.373 (2.194)*			-0.006 (1.137)	0.370	4.169	2.317
10	13.526 (3.146)**	0.025 (3.477)**				-0.146 (0.552)		0.099	3.928	6.216

Notes:

i. Figures in parenthesis are t-values.
ii. The asterisk signs (**) and (*) indicate that the results are significant at one percent and five percent level respectively.
iii. Return on equity is the dependent variable.

Table 5 shows that the beta coefficients for number of ATMs are positive with return on equity. It indicates that number of ATMs has a positive impact on return on equity. This finding is consistent with the findings of Gichungu and Oloko (2015). Similarly, the beta coefficients for DD/TT/SWIFT fees income are negative with return on equity. It indicates that DD/TT/SWIFT fees income has a negative impact on return on equity. This finding is similar to the findings of Scott *et al.* (2017). In contrast, the beta coefficient for Credit Card/ ATM issuance fees income are positive with return on equity. It indicates that Credit Card/ ATM Issuance fees income has a positive impact on return on equity. This finding contradicts with the findings of Njoroge and Mugambi (2018). Moreover, the beta coefficients for DD/TT/SWIFT fees expenses are positive with return on equity. It indicates that DD/TT/ SWIFT fees expenses have a positive impact on return on equity. This finding is similar to the findings of Mueni and Atheru (2019). Likewise, the beta coefficients for VISA Card and Master Card fees expenses are positive with return on equity. It indicates that VISA Card and Master Card fees expenses has a positive impact on return on equity. This finding is consistent with the findings of Rochet and Wright (2010). Moreover, the beta coefficients for bank size are negative with return on equity. It indicates that bank size has a negative impact on return on equity. This finding is similar to the findings of Bebeji et al. (2015).

4. Summary and conclusion

Digitalization is one of the key indicators to get competitive advantage in banking sector. The implementation of proper digital channels to allow customers surf and accept banking transaction will not only benefit the customers but also the banks get an opportunity to expand its area and business as well. Consequently, the use of non-cash payment rises with increasing value. The application of information and communication technology concepts, techniques, policies and implementation strategies to banking services has become a key concern to all banks and indeed a requirement for local and global competitiveness banking

This study attempts to analyze the impact of digitalization on financial performance of Nepalese commercial banks. The study is based on secondary data of 13 commercial banks with 104 observations for the study period from 2015/16 to 2022/23.

The major conclusion of this study is that DD/TT/SWIFT fees income, credit card/ ATM issuance fees income, DD/TT/SWIFT fees expenses, VISA

card and master card fees expenses, number of ATMs, and bank size have negative impact on return on assets. It indicates that higher fees may indicate more card issuance, but excessive fees might deter customers. If these fees are too high, customers may seek alternatives, impacting the bank's profitability. Similarly, higher DD, TT, and SWIFT transactions expenses may indicate increased transaction costs or inefficiencies in processing international and domestic transfers, which could reduce profitability. More ATMs may indicate a larger presence and convenience for customers, potentially increasing usage and revenue. However, maintaining a large ATM network also incurs costs, including installation, maintenance, and security expenses, which can reduce profitability if not managed efficiently. The study also concludes that credit card/ ATM issuance fees income, DD/TT/SWIFT fees expenses, VISA card and master card fees expenses, number of ATMs have positive effect on return on equity. It implies that higher income from credit card and ATM issuance fees contribute directly to the bank's revenue without necessarily increasing its expenses significantly. Moreover, if the bank can effectively manage its credit card and ATM services to attract more customers while keeping costs in check, it can enhance ROE. Efficient management of these expenses, such as negotiating lower transaction costs or optimizing internal processes, can mitigate their negative impact on ROE. Additionally, offering these services can attract corporate clients and enhance the bank's overall revenue, indirectly benefiting ROE. Similar to DD/TT/SWIFT fees expenses, the impact of Visa and Mastercard fees on ROE depends on how efficiently the bank manages these expenses. While the fees represent costs, the bank can offset them by attracting more customers to use its credit and debit cards. Higher card usage can lead to increased transaction volume and revenue, ultimately boosting return on equity in the context of Nepalese commercial banks.

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