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Assessing the Banking and Non-Banking Services Based Financial Technology (FinTech) Performance in Rwanda: Case of Bank of Kigali (BK) and Radiant Insurance (2019-2022)

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Abstract— The study entitled "Assessing the banking and non-banking services based FinTech performance in Rwanda. Case of Bank of Kigali (BK) and Radiant Insurance (2019-2022)" was conducted to assess whether there is no significant correlation between banking and non-banking services and FinTech performance. In other words, FinTech performance is not statistically significant to the banking and non-banking services in Rwanda or not. The study was based on secondary data use only and analysis of existing data from both BK and Radiant Insurance financial statements reports (desk review of data). Data was manipulated based on the need of the researcher but the original meaning was not changed (data transformation). Data analysis was made using bivariate and linear regression models. In Rwanda, both banking and non-banking services are being offered and developed using digital technology which is mainly developed as FinTech. The government and private sector invested more in FinTech to ensure that people everywhere can access banking services and insurance or other non-banking financial services. This has made more changes in the bank's service delivery system and outcomes. The evaluation of secondary data has shown that, by generalization, there is a positive correlation between FinTech performance in banking and non-banking services development and one contributes 39.2% to the other. Independently it was found that Digital investments (X1), Digital Capital Raising (X2), Digital payments (X3), and Digital assets (X4) each contribute 62.6% to the overall banking a non-banking services development in Rwanda. In conclusion, the study confirms that there is a significant correlation between banking and non-banking services and FinTech performance. In other words, FinTech's performance is statistically significant to the banking and non-banking services in Rwanda.

***Index Terms*—Assessing, Banking Services, Non-Banking Services, FinTech, Performance, Bank of Kigali (BK), Radiant Insurance.**

1. Introduction

In Rwanda, both banking and non-banking institutions offer financial services to the population for socio-economic development. However, the difference is linked to the fact that banks offer current account services and deposit account services as well as loans and other banks' financial services with bank operation licenses, while non-banking financial institutions offer financial services without banking licenses. In this study, the researcher intends to evaluate how both non-banking and banking services profit from financial technology performance for development in Rwanda. Here the study intends to assess the extent to which in Rwanda banking services are offered using electronic systems and non-banking services such as insurance services (Grinberg, 2023).

In most developing countries, mainly where poverty still dominates more than 30% of the population is poor like in Rwanda (NISR, 2018), people have less trust in what they don't see like technology, and people believe in money they have not that on accounts or that in technology, which sometimes challenge the use of financial technology while accessing banking an non-banking services (Saiedi, 2018). Shafi (2016), has enumerated several reasons at which financial technology should be developed and trusted such as: Data privacy is a major concern for users when it comes to adopting FinTech services. A staggering 75% of individuals express a desire for access to data on their spending habits, but only 40% are willing to provide the necessary information. FinTech companies must address this concern by adopting transparent practices and reassuring customers about the responsible use of their data (Shafi, 2016). Lack of Familiarity: The relative newness of FinTech companies in the financial services sector contributes to a lack of familiarity, with only 5% of respondents in a 2017 Netherlands survey having heard about FinTech. As awareness grows, so does trust. However, this nascent status also means FinTech companies struggle to establish brand recognition and build trust, particularly when compared to traditional banks with centuries of history. Sector Scandals, such as the Wirecard debacle and the Future Exchange (FTX) collapse, have significantly eroded trust in FinTech companies. Transparency and ethical business practices emerge as critical components in rebuilding and maintaining trust. Without trust, FinTech firms may struggle to attract users, secure investments, and sustain operations (Shafi, 2016). The current study intends to assess the banking and non-banking services based on FinTech performance in Rwanda. Case of bank of Kigali (BK) and

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radiant insurance (2019-2022) (Lewis, W. et al., 2020).

2. Statement of the Problem

Financial technologies or "FinTech" innovations are reshaping the provision of financial services, creating new opportunities and posing new challenges for both the insurance industry and financial supervisors. In February 2017, the International Association of Insurance Supervisors (IAIS) published the report FinTech Developments in the Insurance Industry, which describes FinTech innovations that are relevant to the insurance industry and presents an overview of their potential impacts on the insurance sector and supervisory approaches (Grinberg, 2023). Fintech innovations refer to the variety of emerging technologies and innovative business models that have the potential to transform the insurance business. In the insurance sector, the most relevant innovations are in terms of Emerging technologies: digital platforms, the Internet of Things, telematics, big data, data analytics, comparators, robo advisors, machine learning, artificial intelligence, and distributed ledger technology, including blockchain and smart contracts; Business models: peer-to-peer, usage-based and on-demand insurance. Technological developments and the changing expectations of customers are the main drivers of innovation in the insurance industry. These innovations are being developed both by incumbent insurance companies and by new technology firms or new companies known as "InsurTech" start-ups (Lehane, 2023).

Among the many services they offer, banks are first and foremost money depositories convenient places to stash and retrieve cash. These days, with all sorts of ways to navigate the digital space, banks and financial institutions are making wealth access easier than ever with financial technology, or FinTech. Banks operate digitally, providing basic banking services without any physical branches. These digital financial companies are taking cues from traditional big banks in terms of "what not to do" while offering financial services that cost consumers less. That means, for example, fewer fees and more transparency. These FinTech companies are changing the way people save, bank, budget, and spend their money. Current provides consumers with digital banking services, allowing them to access tools for crypto trading, saving, and building their credit from their mobile devices (Schroer, 2022).

According to Rwanda FinTech Strategy (2022-2027), financial technology (FinTech) has emerged as a key mechanism to deliver greater financial inclusion to enhance the robustness and inclusivity of the financial system as a whole and to drive greater economic growth in markets worldwide. However, if placed in an under-regulated and unsupportive environment, FinTech runs the risk of exacerbating existing challenges in areas such as consumer protection, financial integrity, and economic stability (Republic of Rwanda, 2023). Rwanda's FinTech sector and opportunities are for insurance tech, Wealth tech, Regtech and Cybersecurity, FinTech in agriculture, Capacity building, Data Analytics, and Business process outsourcing (BPO) (Traide, 2022). Bank providers' services using FinTech in Rwanda are 11 by 2023 and only 5 Insurance companies, while mobile banking subscribers in Rwanda are 2 million Rwandans. Here also there are several functions that insurance companies and banks do not accept to be performed in full online which require the presence of the customer and this reduces the efficiency of FinTech performance toward banking and non-banking services development. Thus, this study intends to assess the banking and non-banking services based on FinTech performance in Rwanda, the case of Bank of Kigali (BK) and Radiant Insurance (2019-2022).

3. Empirical Review

As defined from Rwanda FinTech Policy 2022-2027, FinTech is generator to develop various sectors from banking to non-banking services and many others (not targeted in this study) and FinTech has potential for performance such as: (1) the underlying infrastructure is in place to provide FinTech with the rails to build customer-centric solutions. This includes interoperability to enhance payment system efficiency and consistent mobile network quality. (2) the policy, legal and regulatory environment supports FinTech solutions while balancing financial stability, financial consumer protection, data governance, financial inclusion, and competition. This is done through risk-based requirements and a test-and-learn approach to regulating FinTech activities (Republic of Rwanda, 2023). (3) FinTech have access to relevant and appropriate business support, including transparent and timely licensing processes, soft guidance on how to navigate the licensing and compliance process, and the facilitation of collaboration between FinTech and incumbent financial sector players through initiatives such as Fintech Fridays to build the FinTech community. (4) FinTech have diverse avenues to access finance throughout the development lifecycle of the firm from early-stage seed capital to strategic capital for more established FinTech. (5) to this is added market access, facilitated through a digitally and financially literate population people who are aware of their rights and who have access to affordable smartphones, other FinTech friendly technology and devices, and adequately priced digital connectivity. Access to this consumer base needs to be supported by quality internet coverage, which is widely accessible at a reasonable price (Republic of Rwanda, 2023). (6) finally, a thriving FinTech ecosystem is characterized by a strong talent pipeline, developed through a national talent plan, international partnerships to upskill the workforce, and an easily accessible work visa regime. These mechanisms which are used to develop the talent pipeline should go beyond the traditional focus on STEM skills. They should also focus on skills specifically required by the FinTech industry to grow, such as financial skills (having an analytical ability and an awareness of the financial industry) and entrepreneurial skills (invoking a will to start building one's own business and the skills to make this business a success, such as business management skills, strategic thinking and planning, and problem-solving skills) (Republic of Rwanda, 2023).

Elekdag, et al (2023) examines how the growing presence of FinTech firms affects the performance of traditional financial institutions. The findings point to a negative impact on

profitability, primarily due to a reduction in interest income and a rise in operational costs. Although established financial institutions have tried to diversify their revenue streams, these efforts have proven inadequate to offset the losses associated with increased competition from FinTech firms. Elekdag, et al (2023) also reveals that various FinTech business models, such as Peer-to-Peer (P2P) lending and Balance Sheet lending, have varying effects on financial institutions. Cooperative banks experience more significant profit deterioration under both models, whereas (larger) commercial banks appear to benefit from partnerships with P2P platforms, as evidenced by an increase in non-interest income. Furthermore, the findings suggest that FinTech presence has a disproportionately larger adverse effect on banks in countries with more competitive, profitable, and developed financial systems. Interestingly, however, traditional financial institutions in countries with stronger regulatory frameworks appear to benefit from the expanding influence of FinTech firms (Elekdag, 2023).

Lewis W. et al (2020) examined the impact of FinTech/digital financial services on bank performance by tiers in the period before and after interest rate controls in Kenya using both primary and secondary data. The findings from the secondary data show that digital financial services positively and significantly affect the performance of large banks in both periods but positively and significantly affect medium-sized banks only in the interest rate capping period and negatively and significantly affect small-sized in the period after caps. Analysis from the primary data shows that commercial banks still dominate the financial landscape with digital loan services constituting less than 1 percent of the entire loans in the financial system but the provision of loans by non-bank actors is growing. However, the non-bank credit only provides loans at very high-interest rates averaging about 70 percent per annum compared to 10-20 percent offered by commercial banks. Majority of the commercial bank respondents viewed digital financial services as complementary to enhancement of efficiency and scope of financial products and services. The results imply the need for devising strategies that avoid further financial exclusion of the low-income earners who may not afford smartphones, may not have access to internet or may be unfamiliar with smartphone features. Non-bank credit only providers have diverse sources of funds, thus, there is need to understand the implications of alternative sources of funds outside the domestic banking system. Further, the results imply a need to design and implement strategies to equip customers with adequate information including closing the gap between technology and people (Lewis, W. et al., 2020).

Johnson (2021) state that, in the recent past, FinTech has been redefining how organizations are offering their services. To remain competitive in a technologically changing environment, the financial services industry and other organizations are taking major technological transformations, and FinTech is at the center of these transformations. Johnson (2021) aimed at establishing the effect of FinTech on the growth of registered insurance firms in Kenya. The primary predictor variable for the study was FinTech, as measured by the investment in intangible assets by insurance firms. The response variable was the growth measured by the gross direct premiums, the control variables included firm size, firm's profitability, and the firm's liquidity. The study employed descriptive statistics as the study design. Johnson (2021) study collected data from 52 registered insurances for four years. The study used five regression analysis assumptions: the test of normality, the autocorrelation test, the multi-collinearity test, the heteroscedasticity test, and the Hausman test. Data presentation was mainly through the tables. From the study's findings, all the independent variables explained 83.1% of the change in the growth of insurance firms in Kenya. The analysis of the variance illustrated the independent variables used to be a good predictor of the growth of the insurance firms in Kenya. The outcome of the coefficients indicated FinTech to have a positive and significant impact on the growth of the insurance firms in Kenya. This shows that the more the firms invest in FinTech, the higher the growth chances in terms of gross domestic premiums. Firms' size and the firms' level of liquidity showed a positive and significant effect on the growth of insurance firms in Kenya. The firm's profitability demonstrated a negative but insignificant impact on the growth of insurance in Kenya. This indicates in short term the insurance firms use their profitability for their operations rather than for the expansions of their firms (Johnson, 2021).

4. Materials and Methods

This section is consisted by the important methods and techniques used toward the acquisition of valuable data on the hypotheses and objectives assessed.

A. Research Design

The current study is descriptive design as intended to present information on banking and non-banking services using descriptive statistics parameters (numbers, growth rates, ratios and percentages). It is also correlative design as intends to assess the correlation between banking and non-banking services and FinTech performance. The correlation will be evaluated using linear regression model from a time series data, meaning data for the year 2019, 2020, 2021 and 2022 from Bank of Kigali and Radiant Insurance.

B. Population and Sampling

The current study defines population of the study as people or things that contain information needed for the study objectives satisfaction. Here the study population are all beneficiaries of Radiant insurance company and Bank of Kigali however none will be interviewed but the outputs of services consumed will be analyzed (secondary data assessment). Thus the entire research did not used sampling methods as information considered the overall scope from the case study.

C. Conceptual Framework of the Study

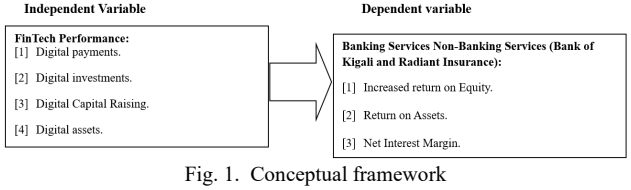

Fig. 1. Conceptual framework

D. Data Collection Tools and Treatment

As defined in point B, the current study intends to use only secondary data and was collected using documentation tool. Here the researcher has assessed information from the BK official reports and Radiant Insurance official report as well as the Ministry of Information Communication and Technology. Here data were not changed from the original contents were treated as it is. Indicators assessed are detailed in conceptual framework and detailed explanations on each indicator was given in point 5.

E. Data Analysis

Data analysis was performed using both descriptive and inferential statistics. Descriptive statistics was made with the current values of assessed indicators for 4 years such as percentages, ratios and growth rates. For inferential statistics Bivariate correlation and linear regression model were tested. Bivariate correlation was for testing Pearson correlation (r) and Sig.(2-tailed). r=+-1 meaning either positive or negative association between two tested variables. Level of significance 5% or 0.05 is the best parameter used to test whether the association between tested indicators is statistically significant (p<=0.05) or not (p>0.05). The multilinear regression Equation [2] assumed the following form:

$Y_{1;2;\&3} = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$. here: $Y_{1;2;\&3}$ = Banking Services Non-Banking Services (Bank of Kigali and Radiant Insurance) by 3 indicators such as Increased return on Equity, Return on Assets and Net Interest Margin. β_0 = constant, X_1 = Digital payments, X_2 = Digital Investments, X_3 = Digital Capital Raising, X_4 = Digital assets and $\beta_{1,\ 2,\ 3,\ 4}$ = Slopes associated with X_1, X_2, X_3, X_4 and X_5, respectively. (X1 to X3 are selected basic functions of FinTech performance). While ε = Error term or the random disturbance term.

F. Study Null Hypothesis

There is no significant correlation between banking and non-banking services and FinTech performance. In other words, FinTech performance is statistically significant to the banking and non-banking services in Rwanda.

5. Study Results

Results were made in form of descriptive and inferential statistics per each indicator as defined in the conceptual framework.

A. Study Information Presentation in Form of Descriptive Statistics

FinTech in Rwanda was developed and facilitated different institutions for effective services delivery, these institutions include banking and non-banking institutions, here the current study has chosen Bank of Kigali which offers bank services and Radiant insurance which offers insurance services and represent non-banking services. Here below is key information presented in form of descriptive statistics parameters.

1) FinTech performance

In Rwanda FinTech has developed at great level, where most bank services and other non-banking services are accessible on phones, on internet and other electronic tools anywhere in Rwanda and to all people without limitation. Due to that both digital capitals has increased over the years, digital payments reduced over the years, digital investments also reduced over the years and digital assets changed over the years.

The FinTech market is rapidly evolving, with digital payments, digital investment, digital capital raising, digital assets, and nonbanking emerging as some of the most significant trends. Digital payments have seen an unprecedented surge in popularity, with consumers increasingly relying on mobile payment solutions for their day-to-day transactions. Digital investment platforms are also gaining traction, with individuals seeking low-cost and easy-to-use investment options. Additionally, digital capital raising has become an attractive option for startups and Small and Medium Enterprises (SMEs), as it provides an efficient way to access funding. The rise of digital assets, such as cryptocurrencies and non-fungible token (NFTs), has also created new opportunities for investors and traders. Finally, nonbanking have disrupted the traditional banking industry by providing innovative, customer-centric solutions that cater to the needs of today's digital-savvy consumers (Statistita, 2024).

As seen from table 1 show that digital capital seems to be zero but not fully zero as it has values but less than 0.5 in thousand USD which by rounds up remain zero. The growth of digital capital raising is not regular as remain 1% from 20192022 and 18.4% from 2021 to 2022 while for other presented years remain above 30%. Digital payments growth rate was reducing over the years but remain positive which shows increase over the years; the regular and high increase also was observed from digital investments which reached 346.1% growth rate from 2018-2019 and for digital assets some reductions were marked for the year 2022 and 2019.

The growth in the FinTech market is driven by several factors. Firstly, the increasing adoption of smartphones and the internet has made digital solutions more accessible to consumers, leading to a surge in demand for FinTech services. Secondly, the COVID-19 pandemic has accelerated the shift towards digital payments and investments, as consumers have had to adapt to remote and contactless transactions. Thirdly,

Table 1
FinTech average revenue per user

FinTech Average Revenues per user	Unit	2022	2021	2020	2019
Digital Capital Raising	Thousand USD	0	0	0	0
	In % (growth)	18.4	32.8	1	36
Digital Payments	Thousand USD	2,012.00	1,593.00	1,127.00	669
	In % (growth)	26.3	41.4	68.4	74.8
Digital Investment	Thousand USD	3,200.00	1,782.00	527.3	171.4
	In % (growth)	79.6	237.9	207.6	346.1
Digital Assets	Thousand USD	173.1	215.1	35.14	7.61
	In % (growth)	-19.5	512	361.7	-10.8

regulatory changes have enabled FinTech companies to compete with traditional financial institutions on a more level playing field. Finally, advancements in technology, such as Artificial Intelligence (AI) and block chain, have opened up new possibilities for FinTech innovation, driving further growth in the market (Statistita, 2024).

The FinTech market is expected to continue its rapid growth trajectory, driven by ongoing technological advancements, changing consumer behavior, and regulatory support. Digital payments are likely to remain a dominant trend, as consumers increasingly prefer the convenience and speed of mobile payment solutions. Digital investment platforms are also expected to grow in popularity, as more individuals seek to manage their finances online. Additionally, the rise of digital assets and nonbanking is likely to continue, as these trends reshape the financial landscape. Overall, the FinTech market is expected to remain dynamic and innovative, with new solutions and services emerging to meet evolving consumer needs (UNCDF-Rwanda, 2023).

Changes has happened, digital capital raising users were increased from 2,090 to 4,000 2019-2022 respectively, digital payments increased from 1,977,000 in 2019 to 3,595,000 in 2022, digital investments increased from 5,810 in 2019 to 15,080 by 2022 (around three times) and digital assets users increased from 7,640 by 2019 to 76,650 by 2022 (around 11 times change). This marked high level of change between 2021 to 2022 and slow down increase for the year 2019-2020 and 2020 to 2021 as this period affected by COVID-19.

Fintech is a term used to describe the companies operating in the financial technology sector. It relates mainly to small start-up companies, which develop innovative technological solutions in such areas as online and mobile payments, big data, alternative finance and financial management. The FinTech industry was growing at an extraordinary pace between 2012 and 2021, including adoption rates, the number of FinTech startups, and investments. However, 2022 was a challenging year for FinTech: The value of investments into FinTech companies slowed down, and the industry saw a drastic increase in job cuts (Republic of Rwanda, 2023).

2) Banking and non-banking services performance measurement (BK and Radiant Insurance Companies)

Banks accepts deposit, lending money, facilitating transactions, and offering various financial products like savings accounts, loans, and credit cards. Banking plays a crucial role in the economy by facilitating the flow of money and enabling economic activities. The performance of the above services can be measured from the return on asset ratio, return on equity ratio and profit ratio because the performance of these services is visualized in these indicators.

Insurance companies are not working like banks but also at the end of their businesses record also change in assets, equity and profit. Insurer help people to cover the costs of unexpected and routine medical bills or hospitalization, accident damage to your car or injury of others, and home damage or theft of your belongings. Here also the performance of all these services will be measured in the value of return on assets, equity and profit ratio.

As seen from the table 3, Bank of Kigali performance indicators the higher efficient of profit generation based on the assets values was observed by 2019 (ROA=3.9%), currently a good rate for ROA is that over 5% and that over 20% is excellent, based on the analysis the BK Return on Asset is not excellent or good but positive and moderate. The BK Return on Equity is good as it shows that from 100$ invested by shareholders they can profit varying between 16$ as minimum to 19.8$ as maximum profit between 2019-2022. NIM show how BK is growing and how is increasing profit over the years. Here show that from the customer's deposits interests paid, the bank is getting higher between 9.7% as minimum rate to 11% maximum rate obtained as of 2019-2022. This is clear that, BK is increasing profitability of the years due to various factors and mainly due to the best practices ensured and performance of FinTech in Rwanda.

Table 4 show that, there several changes over time 2019 to 2022 made by BK which can be associated to the FinTech performance in one way or another. Here number of employees have reduced from 2019 to 2022 as an outcome of FinTech performance where the number of customers attending BK

Table 2
FinTech users by segments

FinTech Users by Segments (in thousands)	Unit	2022	2021	2020	2019
Digital Capital Raising	Thousand	4	3.44	2.76	2.09
	In % (Growth)	16.3	24.6	32.1	35.7
Digital Payments	Thousand	3,595	3,029	2,475	1,977
	In % (Growth)	18.7	22.4	25.2	36.4
Digital Investment	Thousand	15.08	11.49	8.31	5.81
	In % (Growth)	31.2	38.3	43.0	45.6
Digital Assets	Thousand	76.65	47.94	10.86	7.64
	In % (Growth)	59.9	341.4	42.1	36.4

Source: UNCDF-Rwanda, 2023

Table 3
Performance of BK services measurement key performance ratios

BK Key Performance Ratios	2022	2021	2020	2019
Return on Average Assets (ROA), %	3.50%	3.60%	3.30%	3.90%
Return on Average Equity (ROE), %	19.80%	19.10%	16.00%	18.00%
Net Interest Margin (NIM), %	9.70%	10.90%	10.70%	11.00%
Loan Yield, %	14.00%	15.70%	15.70%	16.20%
Interest Expense/Interest Income %	26.50%	22.80%	22.50%	19.40%
Cost of Funds, %	3.70%	3.70%	3.80%	3.10%

Source: BK, 2023

offices has reduced. Number of branches also did not change while number of customers and services demand increases this also the significance of FinTech performance.

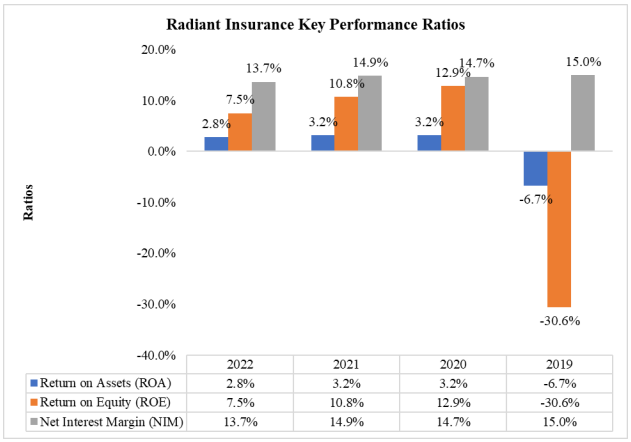

Fig. 2. Radiant insurance company key performance ratios
Source: (Radiant Insurance, 2023)

Figure 2 show that, form 2019 radiant insurance profit was increased where by return on assets change from -6.7% by 20219 to 2.8% by 2022. This is not good profitability vis a vis the assets value but also is moderate and positive as increased since 2019 to 2022. Based on the value of money invested by stakeholders also from 100 USD invested 30.6 USD were lost in 2019, 12.9 USD were gained by 2020, 10.8 USD by 2021 and 7.5 USD by 2022. The net interest margin was great and attractive where remain above 10% from 2019 to 2022.

B. Bivariate Correlation Matrix Analysis

In this section, the study assess correlation for each assessed indicator in conceptual framework from independent to dependent variables 4 to 3 indicators.

Table 6 show that correlation between digital payment to banking and non-banking services is not statistically significant and for some extents is negative. There is a positive correlation between digital payment on increased return on assets of BK, Net interest margin of BK and that of Radiant insurance. For remaining there was observed negative correlation. Digital assets were found best significant and remain positive from overall indicators assessed on the side of banking and non-banking services. Here it is specific that digital assets contribute 3.9% in increased return on equity of BK, 39.5% in BK return on assets, 30% in net interest margin of BK, for radiant

Table 4
BK selected operating data

Selected Operating Data	2022	2021	2020	2019
Full Time Employees	1,214	1,189	1,262	1,235
Assets per FTE (Frw in billion)	1.5	1.3	1	0.8
Number of Branches	68	68	68	68
Number of Mobibank/ Outlets	22	22	22	22
Number of ATMS	96	96	97	94
Number of POS Terminals	3,099	2,723	2,813	2,233
Number of Retail Customers	422,513	380,297	356,299	331,221
Number of BK Yacu Agent	3,853	3,504	2,341	1,654

Source: BK, 2023

Table 5
Radiant insurance key performance indicators

Statement of comprehensive income of Radiant Insurance ('000 Frws)	2022	2021	2020	2019
Net Insurance revenue	11,681,332	10,677,383	9,673,434	9,673,434
Net insurance claims	-9,609,737	-8,710,679	-7,811,621	-6,912,563
Profit for the year	735,296	722,946	574,494	-1,190,368
Total Assets	26,370,272	22,456,514	17,879,722	17,849,534
Total equity	9,756,509	6,721,214	4,466,849	3,894,350

Source: Radiant Insurance, 2023

Table 6
Bivariate correlation analysis indicator to indicator

Correlations							
		Increased return on Equity/BK	Return on Assets/BK	Net Interest Margin/BK	Increased return on Equity/ Radiant Insurance	Return on Assets/ Radiant Insurance	Net Interest Margin/ Radiant Insurance
Digital payments	r	.339	-.752	.841	-.636	-.578	.841
	p	.661	.248	.159	.364	.422	.159
	N	4	4	4	4	4	4
Digital investments	r	.710	-.400	.698	-.925	-.895	.698
	p	.290	.600	.302	.075	.105	.302
	N	4	4	4	4	4	4
Digital Capital Raising	r	.339	-.742	.873	-.614	-.555	.873
	p	.661	.258	.127	.386	.445	.127
	N	4	4	4	4	4	4
Digital assets	r	.039	.395	.300	.392	.382	.300
	p	.961	.605	.700	.608	.618	.700
	N	4	4	4	4	4	4

Correlation is significant at the 0.05 level (2-tailed).
Keys: p: Sig. (2-tailed)
r: Pearson Correlation

insurance indicators analysis the digital assets contribute 39.2%, 38.2% and 30% of Radiant insurance ROE, ROA and NIM respectively. And the findings show that, this correlation or contribution is not statistically significant.

C. Linear Regression Model

To make linear regression model simple all tested data were transformed by calculating the growth rates for all values (FinTech measured indicators as already presented and growth rates for Banking and Non-Banking services performance indicators such NIM, ROA and ROE) since 2019 to 2022, however for the year 2019 the value is obtained going back also to the value of 2018. The model for dependent variable was reduced to obtain a single indicator recorded as Banking and Non-Banking services (this was represented by the average of 2019 to 2022 growth rates of values from both BK and Radiant Insurance Equity, Asset and NIM). Here below are results:

From Table 7, an (R^2) of 1 indicates that the regression predictions perfectly fit the data. This shows that, the analyzed model feet at 39.2% as (R^2) is equal to 0.392. R is also equal to 0.626 meaning that, Digital assets, Digital Capital Raising., Digital investments and Digital payments as indicators of FinTech performance in Rwanda each contribute 62.6% to the banking and non-banking services development case of BK and Radiant insurance respectively.

Table 8, the results show that the model had an F ratio of 3.432 and the P value was 0.000<0.042, signifying that the F ratio was statistically significant, therefore the overall regression model for all the variables tested were statistically significant and can be used for prediction at 5% significant level. This further indicate that the predictors variables (Digital investments (X1), Digital Capital Raising (X2), Digital payments (X3), and Digital assets (X4) used in this study as FinTech performance indicators are statistically significant to the banking and non-banking public services development. Due to that, the settled hypothesis is failed to be accepted in favor of alternative hypothesis and the study confirm that "there is a significant correlation between banking and non-banking services and FinTech performance. In other words, FinTech performance is statistically significant to the banking and non-banking services in Rwanda".

Table 9 gives the following linear equation:

$$Banking\ and\ Non-Banking\ Services\ or\ Y = 2.492 - 0.572X1 + 0.513X2 + 0.165X3 + 0.002X4$$

This means that, there is a positive correlation between Digital investments (X1), Digital Capital Raising (X2), Digital payments (X3), and Digital assets (X4) as FinTech performance in Rwanda measurement indicators toward banking and non-banking services development case of BK and Radiant Insurance Company. However, a negative correlation was marked between banking and non-banking services development and Digital Investment. In other words, one unit change from the one above indicators (4 listed above) lead to change of -0.572; 0.513; 0.165 and 0.002 change times additional value to the current units of the banking and non-banking services development. In other words, once indicators of independent variable are absolute, the banking and non-banking services development equal to 2.492 units. As conclusion the null hypothesis: "There is no significant correlation between banking and non-banking services and FinTech performance. In other words, FinTech performance is statistically significant to the banking and non-banking services in Rwanda" is rejected in favor of alternative hypothesis "There is a significant correlation between banking and non-banking services and FinTech performance. In other words, FinTech performance is statistically significant to the banking and non-banking services in Rwanda".

Table 7
Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.626[a]	.392	.277	2.87699

a. Predictors: (Constant), Digital assets, Digital Capital Raising., Digital investments, Digital payments

Table 8
ANOVA Table for the tested variables

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	85.219	3	28.406	3.432	.042[b]
	Residual	132.434	0	8.277		
	Total	217.653	3			

a. Dependent Variable: Banking and Non-Banking services
b. Predictors: (Constant), Digital assets, Digital Capital Raising, Digital investments, Digital payments

Table 9
Coefficients table for linear regression analysis

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.492	5.664		.440	.666
	Digital investments (X1).	-.572	.209	-1.150	-2.739	.015
	Digital Capital Raising (X2).	.513	.243	.850	2.113	.051
	Digital payments (X3).	.165	.233	.364	.742	.463
	Digital assets (X4).	.002	.005	.083	.392	.700

a. Dependent Variable: Banking and Non-Banking services

6. Conclusion

In Rwanda both banking and non-banking services are being offered and developed using digital technology which mainly developed as FinTech. The government and private sector invested more in FinTech to ensure that people everywhere can access to banking services and insurance or other non-banking financial services. This has made more changes among banks services delivery system and outcomes. The evaluation of secondary data has shown that, by generalization, there is positive correlation between FinTech performance to banking and non-banking services development and one contribute 39.2% to the other. Independently it was found that Digital investments (X1), Digital Capital Raising (X2), Digital payments (X3), and Digital assets (X4) each contribute 62.6% to the overall banking a non-banking services development in Rwanda. As conclusion the study confirms that there is a significant correlation between banking and non-banking services and FinTech performance. In other words, FinTech performance is statistically significant to the banking and non-banking services in Rwanda.

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