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THE NEXUS OF TECHNOLOGY ADOPTION AND FINANCIAL INCLUSION IN RURAL AREAS OF SWAT

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ABSTRACT

This research study scrutinizes, the impact of technology adoption (TA) on the financial inclusion (FI) in the rural areas of Swat. FI is important for the rural region to improving the living standards, where traditional banking services are limited. By the increase of mobile technology and internet access, digital financial services tool like mobile banking, digital wallets, and e-commerce has to be used by endorsing the FI in the rural areas. The regression analysis as used to examine the association amongst the TA and FI in the rural areas of Swat. Two models as used the first one is focusing on the impact of TA on the FI and another are examining that how FI and income influence TA. Data is collected through a questionnaire of 300 people in Swat. The result shows a substantial positive relationship amongst TA and FI. Increasing the adoption of technology, leads to improve the access to the financial services in rural Swat. Digital literacy and household income also important factors. Higher income levels and better digital financial literacy both have higher adoption rates. This study identifies barriers such as limited internet access, cultural factors, and lack of awareness that hinder the full utilization of digital financial services in rural areas. The research recommends growing technological infrastructure, which perceive the digital literacy programs, and designing inclusive financial policies to further improve FI. Offers valuable awareness for policymakers, and financial institutions to improve financial accessibility and supporting socioeconomic development in the rural areas of swat.

Keywords: *Technology Adoption, financial inclusion, Rural Development, digital Banking, Swat areas.*

INTRODUCTION

The Financial Inclusion refers to make sure the accessibility, to financial products and facilities, with the reasonable availability of financial facilities to all the communities and industries. The Financial inclusion ensures to administer a reasonable financial facility, timely financial products for all the people and businesses, enhancing financial literacy, savings, credits, coverage, and contribution to a nation's economic welfare. World Bank (2019) Pakistan is one of the less significant developments in technology adoption, driven by increasing internet and mobile dispersion. The country has more than 100 million wideband subscribers of mobile users, with over 185 million mobile subscriptions. Smartphone adoption is also on the increase, with over 100 million users by 2023. Digital payments and e-commerce events have increased, with mobile wallets and online payment stands becoming popular. The government has launched initiatives to promote digital connectivity and technological development, such as the Digital Pakistan Vision, which aims to improve digital infrastructure, improve digital literacy, and foster revolution in technology sectors. However, problems including infrastructural limitations, security concerns, and a technological divide between urban and rural

regions is linger on since the start to be solved. By tackling these issues, we may boost economic growth, better government policies, and improve people's standard of life through the use of technology. Pakistan's technology industry has grown in a beneficial way, with new IT startups and businesses forming in finch, e-commerce, and software development, between other sectors of financial developments. This growth is supported by a young, tech-savvy population and increasing interest in entrepreneurship. Pakistan is graceful to connect the potential of technology to foster the financial development across various sectors of financial services. Digital Pakistan Vision (2020).

Financial Inclusion in Pakistan

In Pakistan Financial inclusion is an important effort due to its suggestions for economic development and poverty reductions. In 2017, about 21% of adults of Pakistan access a bank account, while this number has seen some change on the later years. Lumps to financial inclusion contain restricted physical contact to banking facilities in rural zones, while small levels of financial learning, and cultural blocks that discourage females from finding financial services. The government of Pakistan has started numbers of activities, the goal is by educating financial inclusion, contain the (NFIS) National Financial Inclusion Strategy, digital financial services, and the well-traditional finance sector. Mobile investment and mobile wallets have become progressively popular, offering opportunities and accessibility of the financial services to a different group of the local residents. Despite the challenges such as (directing limits, organization restrictions, and the need for improved financial learning programs), improvement has been made to improve the formal financial services across the countryside. By confronting these challenges, more chances of inclusive economic development and poverty redemption in Pakistan. State Bank of Pakistan (2020)

Financial Inclusion in Khyber Pakhtunkhwa (KPK) and Swat

In Khyber Pakhtunkhwa (KPK), rural province, faces financial inclusion technical hitches due to its need of accessibility to the official banking facilities such as credit and savings accounts. Residents of rural areas, usually facing difficulties by traveling long distances to access the financial services. Despite the challenges in KPK, proper financial services, such as microfinance institutions (MFIs) and microfinance banks (MFBs) that provide besieged financial choices for the individuals who are existing in the rural areas are increasing the financial development by an easy access to the financial products and services. Pakistan Microfinance Network (2021) Microfinance banking plays a central role by distributing financial services to rural households and small industries in Swat region. By contributing micro-loans, savings accounts, and insurance products will help the community to attain the financial inclusion through different financial institutions. Digital financial services, like mobile investment and mobile wallets, are introducing to bridging the contact of financial services through fast fact technology, in the rural areas of Swat especially among the residents with limited physical access to banks. Microfinance Banks in Pakistan (2022)

2. Research Questions

This research study will answer the questions that:

I. What are the impacts of technology adoption on the financial inclusion in the rural areas of Swat?

II. What are the key factors influencing technology implementation for the financial inclusion in rural Swat?

3. Research Objectives

This research study has the following key objectives to achieve:

1. To identify and analyze the impact of technology adoption on the financial inclusion in the rural area of swat.
2. To identify the main factors influencing technology adoption and financial inclusion in rural Swat.

4. Hypotheses

H_0: There is significantly increase in the financial inclusion by the adoption of higher levels of Technology in the rural areas of Swat.

H_A: There is significantly decrease in the financial inclusion by the adoption of higher levels of Technology in the rural areas of Swat.

5. METHODS AND TECHNIQUES

Model Specification

This research study measures the impact on technology adoption by the financial inclusion in rural area of Swat. Though the hypothesis that the higher levels of technology adoption will lead to increased financial inclusion. The Regression analysis models are used to calculate the correlation between technology adoption and financial inclusion through regression equations.

Financial Inclusion Model

Financial Inclusion (FI) = β0 + β1TA + β2DL + ϵ,

1. FI: Dependent variable
2. TA: Independent variable (Technology Adoption)
3. β0: Intercept
4. β1: Coefficient of Technology Adoption
5. DL: Independent variable (Level of Digital Literacy)
6. β2: Coefficient of Digital Literacy

Technology Adoption Model

Technology Adoption (TA) = β0 + β1FI + β2I + ϵ,

1. TA: Dependent variable
2. FI: Independent variable (Financial Inclusion)
3. β0: Intercept
4. β1: Coefficient of Financial Inclusion
5. I: Independent variable (Average Household Income)
6. β2: Coefficient of Income

Research Design

Using quantitative method approach the research is designed to identify the relationship among financial inclusion, technology adoption, digital literacy and household income. By the conducting of Pearson correlational and regression analyses to analyze to see how strong these relationships.

Research Framework

The hypothetical framework is on the following hypotheses:

1. Financial Inclusion and Household Income significantly impact Technology Adoption.
2. Technology Adoption and Digital Literacy positively influence Financial Inclusion.

Population Sampling

Population

The population N of this study include the overall residents in the rural areas of Swat. In specifically, focusing on that individuals and households who use financial services and technology.

Sampling Technique

Simple Random Sampling method was used in the research, which confirms that every individual has an equal chance to participate. Therefore, it good reflection of the whole population of rural Swat.

Sample Size

About 300 residents of swat will be measured using a formula for estimating proportion with a confidence level of 95% and margin of error of 5%.

Collection of Data

Data Source

The Primary Data will be collected by questionnaires, designed for quantitative data from rural residents who are 18 years and older, financial service workers, and residents.

Data Collection Instrument

The organizing of questionnaire evaluates as the following:

1. Financial Inclusion: The use and access of financial services.
2. Technology Adoption: Usage and acceptance of digital tools and technologies.
3. Digital Literacy: Knowledge and skills regarding effective use of digital tools.
4. Household Income: Monthly income levels.

Variables and Measurements

TABLE1: VARIABLE SPECIFICATION OF MODEL 1

Variables	Type	Measurement
Financial Inclusion	Dependent	By Measuring using a 5 Point Likert scale
Technology Adoption	Independent	By Measuring using a 5 Point Likert scale
Digital Literacy	Independent	By Measuring using a 5 Point Likert scale

In the 1st Model the Financial Inclusion is dependent variables in technology adoption and digital literacy as independent variables in measure it by using 5 point like Financial Inclusion

TABLE 2: VARIABLE SPECIFICATION OF

Variable	Type	Measurement
Technology Adoption	Dependent	By Measuring a 5 Point Likert scale is used
Financial Inclusion	Independent	By Measuring a 5 Point Likert scale is used
Household Income	Independent	By Measuring a 5 Point Likert scale is used

MODEL 2

In the 2nd Model, Technology adoption is dependent variables in Financial Inclusion and income as independent variables in measure it by using 5-point technology adoption.

6. RESULTS AND DISCUSSION

Descriptive Statistics

Table 4.1: Descriptive Statistics for Model 1st

Means and Standard Deviations of (Financial Inclusion, Technology Adoption and Digital Literacy).

Descriptive Statistics of the 1st Model

	Mean (μ)	Std. Deviation (σ)	Population (N)
Financial Inclusion	3.0933	1.47826	300
Technology Adoption	3.2167	1.47546	300
Digital Literacy	2.4967	1.52021	300

The means of these three variables is between 2.5 and 3.2 indicating a tendency is near to the higher end of the scale for each variable. In The standard deviations for all three variables are relatively similar (~1.48–1.52) show moderate variability in the responses across the sample.

Descriptive Statistics

	Mean (μ)	Std. Deviation (σ)	Population (N)
Technology Adoption	3.2167	1.47546	300
Financial Inclusion	3.0933	1.47826	300
Monthly Household Income (In PKR)	2.9400	1.42237	300

Table 4.2: Descriptive Statistics for Model 2

Means and Standard Deviations of (Financial Inclusion, Technology Adoption and Average Household Income).

The means of these three variables is between 2.9 and 3.2 indicating a tendency is near to the higher end of the scale for each variable. In The standard deviations for all three variables are relatively similar (~1.48–1.52) show moderate variability in the responses across the sample.

Pearson Correlation

Table 3 Pearson Correlation for Model 1

Correlations				
		Financial Inclusion	**Technology Adoption**	**Digital Literacy**
Pearson Correlation	Financial Inclusion	1.000	0.330	0.344
	Technology Adoption	0.330	1.000	0.392
	Digital Literacy	.344	.392	1.000
Significant (One-Tailed)	Financial Inclusion	0.0	0.000	0.000
	Technology Adoption	.000	0.0	0.000
	Digital Literacy	0.000	0.000	0.0
Population (N)	Financial Inclusion	300	300	300
	Technology Adoption	300	300	300
	Digital Literacy	300	300	300

Correlation (Financial Inclusion, Technology Adoption and Digital Literacy).

The correlation between Technology Adoption and Financial Inclusion is 0.330 which shows a positive correlation. Which means that the Technology Adoption increases, it increases the Financial Inclusion. For correlation the p value is 0.000, This illustrates that the correlation is statistically significant because the p value is less than the common alpha level of 0.05. Null Hypothesis (H_0) suggests that there is a significant increase in financial inclusion with the adoption of higher levels of technology. This is true because the positive correlation of 0.330 shows that financial inclusion increases with technology adoption. The relationship is optimistic and statistically significant where the p-value = 0.000, so statistically significant positive relationship exists.by using the data, the adoption of advanced levels of technology in the rural areas of SWAT leads to the growth in the financial inclusion. Hence, this result supports the null hypothesis (H_0), indicating a positive relationship among the technology adoption and financial inclusion.

Correlations				
		Technology Adoption	**Financial Inclusion**	**Monthly Household Income (In PKR)**
Pearson Correlation	Technology Adoption	1.000	.330	.170
	Financial Inclusion	.330	1.000	.112
	Monthly Household Income (In Pkr)	.170	.112	1.000
Sig. (1-Tailed)	Technology Adoption	.	.000	.002
	Financial Inclusion	.000	.	.026
	Monthly Household Income (In Pkr)	.002	.026	.
N	Technology Adoption	300	300	300
	Financial Inclusion	300	300	300
	Monthly Household Income (In PKR)`	300	300	300

Table 4 Pearson Correlation for Model 2

Correlation (Financial Inclusion, Technology Adoption and Average Household Income).

The relationship among the technology Adoption and Financial Inclusion shows a positive correlation. Which means that the rise in Technology Adoption, as it increases the level of financial Inclusion, where the p-value is < 0.001, which shows the significant relationship. The Technology Adoption and Average Household Income is also showing positive correlation it means that increases average household income will be increases technology Adoption. Where, the p-value is 0.002 indicates that this relationship is significant.

Table 5ANOVA for Model 1

ANOVA

Model		Sum of Squares	Degree of freedom	Mean Square (μ)^2	F-Statistics	Sig.
1	**Regression**	106.589	2	53.295	28.948	.000[b]
	Residual	546.797	297	1.841		
	Total	653.387	299			

A. Dependent Variable: Financial Inclusion

B. Independent variables: (Constant), Digital Literacy, Technology Adoption

ANOVA of (Financial Inclusion, Technology Adoption and Digital Literacy).

The F-statistic value is 28.948, which shows a significant at p < 0.001, expressing the statistically significant Regression model. Which shows that the independent variables (Technology Adoption and Digital Literacy) are collectively describe a significant percentage of the variance in the financial inclusion.

ANOVA

Model		Sum of Squares	Degree of freedom	Mean Square (μ)^2	F-Statistics	Sig.
2	**Regression**	82.418	2	41.209	21.529	.000
	Residual	568.498	297	1.914		
	Total	650.917	299			

A. Dependent Variable: Technology Adoption

B. Independent Variables: (Constant), Monthly Household Income, Financial Inclusion

Table .6 ANOVA for Model 2

ANOVA of (Financial Inclusion, Technology Adoption and Average Household Income).

This table summarizes the complete fit of the \regression model, which interprets the Financial Inclusion (FI) and Average Household Income (I) together is explain a significant relation of Technology Adoption (TA). Sum of Squares value is 82.418, which Represents the variability in Technology Adoption that is explained by the conjecturers FI and Income. the high F-value indicates that the model variables present correlation. The p-value < 0.001, the value indicates statistically significant regression model. The statistically significant p-value shows that Financial Inclusion and Household Income are meaningful predictors of Technology Adoption, though additional factors may also play a role.

1st Model Summary

					Statistics Change					Durbin-Watson
Model	R	R^2	Adjusted R^2	Std. error Estimate	R^2 Change	F Change	Df-1	Df-2	Sig. F Change	
1	0.404[a]	0.163	0.157	1.35686	0.163	28.948	2	297	0.000	1.905

1. Independent Variables: (Constant), Digital Literacy, Technology Adoption

2. Dependent Variable: Financial Inclusion

Table 7 Overall significance of the Model 1

Model Summary of (Financial Inclusion, Technology Adoption and Digital Literacy).

The outcomes obtained from the collected data, and multiple regression analysis with the financial Inclusion as the dependent variable and Digital Literacy and Technology Adoption are the independent variables. R-Value 0.404 which show the positive correlation between the predictors (Digital Literacy and Technology Adoption) and the dependent variable (Financial Inclusion). In the tabulated data R^2 Value is 0.163, signifies the percentage of variance in the Financial Inclusion that is clarified by the technology Adoption and Digital Literacy. About 16.3% of variance in the financial inclusion can be explained by these two variables. The Adjusted R^2 Value is 0.157 that clarify that the number of variables in the model, providing a truer estimate of how well be the independent variables explain the dependent variable. The Standard Error of the Estimate Value is equal 1.35686, which represents the average distance that observed values drops from the regression line. A small value of this standard error would specify a better fit to the model derived from the data estimated.

Table 9 Overall significance of the 2nd Model

2nd Model Summary

					Statistical Change					Durbin-Watson
Model	R	R^2	Adjusted R^2	Std. error Estimate	R^2 Change	F Change	Df-1	Df-2	Sig. Change	F
2	0.356[a]	0.127	0.121	1.38352	0.127	21.529	2	297	0.000	1.939

1. Independent Variables: (Constant), Monthly Household Income, Financial Inclusion
2. Dependent Variable: Technology Adoption

Model 2nd Summary of (Financial Inclusion, Technology Adoption and Average Household Income).

The value of correlation coefficient of 0.356 which shows a positive correlation between the both interpreters (Average Household Income and Financial Inclusion) and Technology Adoption. Which means the derived values elaborates that the independent variables (Income and Financial Inclusion) increase the technology adoption. The R^2 value signifies the percentage of the variance in the dependent variable (Technology Adoption) that is illustrated by the independent variables (Average Household Income and Financial Inclusion). In the table above, 12.7% of the variation in Technology Adoption is illustrated by the regression model. The standard error estimate provides a suggestion that how much the predicted values of Technology Adoption effect from the actual values. The value 1.38352 shows that, on average, the model's estimates are off by 1.38 units from the observed data.

Table 9 Coefficients for Model 1st

Coefficients

Model FI = β0+β1TA + β2DL + ϵ.		Unstandardized Coefficients		Sig.	Correlations			Collinearity Statistics	
		B	Std. Error		Zero-order	Partial	Part	Tolerance	VIF
1	Constant	1.735	.200	.000					
	Technology Adoption	.231	.058	.000	.330	.226	.212	.847	1.181
	Digital Literacy	.247	.056	.000	.344	.247	.233	.847	1.181

a. Dependent Variable: Financial Inclusion

Coefficients of (Financial Inclusion, Technology Adoption and Digital Literacy).

FI = β0+β1TA + β2DL + ϵ. FI = 1.735+0.231TA + 0.247DL + ϵ.

FI (Financial Inclusion) is the dependent variable. TA (Technology Adoption) and DL (Digital Literacy) are the independent variables. Constant (Intercept) β0 is 1.735 this shows that when both Technology Adoption (TA) and Digital Literacy (DL) are zero, the value of Financial Inclusion (FI) is 1.735. Technology Adoption (TA), β1 = 0.231, it shows that increase in each unit of Technology Adoption, the Financial Inclusion, (FI) increases by 0.231 units, by assuming all other factors constant. Which shows that the coefficient is statistically significant, p < 0.001, implying a strong positive impact of Technology Adoption on Financial Inclusion. Digital Literacy (DL) β2 = 0.247 this shows that for each unit increase in Digital Literacy, Financial Inclusion (FI) will be increases by 0.247 units, assuming other factors remain unchanged. The coefficient is statistically significant, p < 0.001, signifying that higher digital literacy positively influences the use of financial technologies, there by promoting financial inclusion. The t-values for both Technology Adoption 3.990 and Digital Literacy 4.398 are significantly high, which shows that both predictors are statistically significant. Where the p values for both variables are less than 0.001 which further confirms that both Technology Adoption and Digital Literacy have a strong positive relationship with Financial Inclusion.

TABLE 10 COEFFICIENTS FOR MODEL 2

Coefficients

Model TA= β0+β1FI + 2 I +ϵ.		Unstandardized Coefficients			95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
2	(Constant)	1.834	.237	.000	1.368	2.301					
	FINANCIAL INCLUSION	.314	.054	.000	.207	.421	.330	.317	.312	.987	1.013
	Monthly Household Income (in PKR)	.140	.057	.014	.029	.251	.170	.142	.134	.987	1.013

A. Dependent Variable: Technology Adoption

Model Summary of (Financial Inclusion, Technology Adoption and Average Household Income)

TA = β0+β1 FI + β2I + ϵ. TA=1.834+0.314·FI+0.140·I

Technology Adoption =1.834+0.314 Financial Inclusion +0.140 Average Monthly Household Income

Technology Adoption (TA) is the dependent variable. Financial Inclusion (FI) and Average Monthly Household Income (I), are independent variables. The value of Intercept is 1.834, which represent the base level of Technology Adoption when FI and I are both zero. The Coefficient value for FI is 0.314, which mean that for any one-unit increase in the Financial Inclusion the Technology Adoption will be increases by 0.314 units. The Coefficient income is 0.140 which show that for every one-unit increase in Monthly Household Income will changes Technology Adoption increases by 0.140 units. The p-values = 0.000, illustrate that the Financial Inclusion has a positively significant relationship with the Technology Adoption. Where the p-value of Monthly Household Income is p = 0.014 also shows the statistically significant and positive relationship with the Technology Adoption.

7.Conclusion of the study

This research finds out the impact of technology adoption on financial inclusion in the rural areas of district Swat. Which show that the technology adoption plays an important role in the increase of financial inclusion. By providing peoples with a better access to financial services like mobile banking, digital wallets and other financial tools, these were unreachable earlier due to the limited

traditional banking infrastructure. The result show that the financial inclusion has a positive and statistically significant effect on technology adoption, which means that the financial services need more accessibility there were greater willingness and ability to adopt technologies like mobile banking and e-wallets. Monthly household income is also a significantly correlated to the technology adoption, which mean that the Households with higher incomes are more feasible to adopt technology because they have the financial resources to afford the devices and internet connectivity. Hence, income changes the main role to determine the access to digital financial services. This study also finds that the digital literacy is the necessary authorization that people can effectively use digital financial services. The basic understanding of how to use technology, need batter educational programs that should give to individuals or community who are willing to access digital tools that are necessary to understand and use digital skills. With the positive effects of technology adoption on financial inclusion same barriers still exist in the rural areas of Swat, where the limited digital infrastructure and cultural factors discourage the use of technology among the females. The rural area communities still have lack of awareness about the available financial services. These barriers are crucial for confirming that technology can be fully utilizing to improve the financial inclusion.

8.Recommendations

Based on the conclusions of this study it endorses that the government and financial institutions should work together to improve the influence of mobile banking and digital financial services in the rural areas of Pakistan. This includes the increasing availability of mobile banking agents and ATMs in rural population of swat. Also support for microfinance institutions and rural banks are important to help the rural residents by providing small loans and financial products without the access to traditional banking services. There is a need for greater investment in digital organizations like internet connectivity, mobile networks and provision of smartphones, by improving these resources will allow more residents in rural areas to access digital financial services. Different Programs that subsidizing the cost of smartphones and internet services for low-income households could help reducing the economic barriers to the adoption of technology. The government and NGOs should cooperate to implement digital literacy programs, increase awareness and competence in using digital financial tools. These programs should target both the youth and adults, of the community with a special focus on the women and marginalized group. To adopt digital technologies Community centers, local organizations have to play a fundamental role by allocating digital literacy programs. Peer-to-peer education where locals teach others in their communities, which can be an effective way to spread knowledge and build confidence in using financial technologies. Policymakers should design inclusive financial services that deliver exactly the needs of rural populations which includes offering small-scale loans in the savings accounts and insurance products that are available and reasonable. This Effort should be made to confirm that women in the rural areas have equal access to the financial services and technology, which could include creating women-friendly mobile platforms and offering financial literacy programs for women and addressing cultural barriers that limit women's access to technology and financial services.

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