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Platform & Workflow by: [Open Journal Systems](#)**The impact of digitalization and automation on jobs market and skills development in Pakistan's banking sector****Mushtaq Ahmad Ghani**

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ABSTRACT

Pakistan's banking system is an example of rapid digitalization and automation due to Artificial Intelligence (AI), Robotic Process Automation (RPA), Blockchain and Mobile Banking. Due to the benefits these technologies introduced to banking systems, some challenges are caused concerning the stability of employment and the development of skills among the workforce. This research aims at studying the effects of digitalization and automation on employment and skills development in the banking system of Pakistan. This study uses workforce flexibility (as a mediating variable) and corporate training initiatives (as a moderating variable). A mixed-methods concurrent triangulation design was employed, and surveys were administered to 383 banking professionals from conventional and Islamic banks located in the Islamabad–Rawalpindi corridor. Multiple regression, and PROCESS macro mediation and moderation analyses were performed (Hayes, 2022). The findings revealed that digitalization ($\beta = .320$, $p < .001$) and automation ($\beta = .609$, $p < .001$) are both significantly and strongly predictive of the restructuring of the job market. Automation and digitalization, together, explained the skills development variance ($R^2 = .586$) with the strong predictive power of automation. Workforce flexibility was found to partially mediate the relation between digitalization of the workforce and skills development (indirect $B = .064$, Boot 95% CI [.027, .103]). The automation of corporate training initiatives was found to significantly and negatively impact skills development ($B = -.017$, $p = .029$). This suggests that highly trained corporations lessen the dependence on automation to improve skills but use corporate training instead. These results expand Human Capital Theory and Technological Disruption Theory in the context of Pakistan's dual Islamic and conventional banking systems. They also have clear impacts on State Bank of Pakistan regulatory policy and on banking human resource strategy and workforce equity.

Keywords: Digitalization, Automation, Fintech, Workforce adaptability, Corporate Training Programs.

1. Introduction

The global financial sector has reorganized due to rapidly changing digital technologies. New structures and ways of working have shifted the skills needed to remain competitive (Berger & Frey, 2016; Brynjolfsson & McAfee, 2014). In the last ten years, financial companies have begun to utilize advanced technologies such as artificial intelligence (AI), robotic process automation (RPA), blockchain, big data, and cloud systems. Increased efficiency, support, and improved decisions during the business process have been the result of the implementation of those technologies (Han et al., 2024; Du et al., 2019; Islam et al., 2021). The development of these technologies has created tensions due to job displacement, the need to retrain, and the restructuring of organizations (Brynjolfsson & McAfee, 2017; Arntz et al., 2017).

The banking sector is one of the most responsive industries to technology in Pakistan. The adoption of fintech, automation, branchless banking, biometric and blockchain banking, e-KYC, and AI-based credit scoring has been rapid by Pakistani Banks. (Liu & Li, 2020; Malik & Jamil, 2022). The scheduled commercial banks of Pakistan employ about 200,000 people. The industry has been one of the most stable in providing formal employment. In 2023, the rate of unemployment in Pakistan reached 9.6 (Mahbub ul Haq Research Centre, 2023). Job automation technologies have impacted the traditional banking job market, which has seen a 25 to 30 percent loss in employment in Pakistan, which is deemed to be a loss of a stable employment sector, during the period of 2018 to 2024 (Social Science Review Archives, 2024). Digital banking has transformed business practices by presenting new opportunities for data analysts and information technology practitioners.

The goal is not whether the modernization of technology leads to the creation or annihilation of jobs (the evidence suggests that both happen). Instead, the more pertinent challenge is if the banking workforce in Pakistan is able to adjust to changes of vanishing jobs and new jobs with equity and with the necessary support from institutions, which existing research, which has largely centered on advanced markets, will not be able to address for Pakistan's dual Islamic and conventional banking system, which has a 68 percent rural population and a new digital regulator.

Several things will be accomplished by this research. First, it will be the first time Technological Disruption Theory (Christensen, 1997) and Human Capital Theory (Becker, 1964) will be applied in the banking contexts of emerging markets. Second, have the first empirical data to support claims that automation and digitalization have prime specific effects on the job market and creation of new skills. Third, in the context of developing banking markets, it will provide the first time analysis of workforce adaptability and the effects of corporate training. Fourth, it will offer evidence for Pakistan to help State Bank of Pakistan (SBP) create banking regulatory policy, and help improve the banking sector's human capital and workforce development initiatives.

2. Literature review

2.1. Theoretical foundations

Human Capital Theory (Becker, 1964; Schultz, 1961) recognizes the productive power of workers relative to the investment of knowledge, skills, and competencies, arguing that training people is a positive investment in human capital that pays dividends in productivity. Their contemporary derivatives recognize dynamic human capital, the ability of employees to continually update and refine their skills to adapt to new technologies (Becker, 1993). This is especially important in the modern world where fast, disruptive technologies quickly make formerly useful skills stale (Autor, 2015).

Technological Disruption Theory (Christensen, 1997; Christensen, Raynor, & McDonald, 2018) describes the impact of digital technology on value chains and structures and the subsequent redundancy of many roles and a vacuum for new work. Organizations that do not integrate their human capital with the new technologies are likely to get further behind, while companies that use disruption to prioritize reskilling and create a competitive advantage are more likely to succeed. The Routine-Biased Technological Change (RBTC) theory (Autor & Dorn, 2013) states that automation will replace standard cognitive and manual tasks and will supplement and increase demand for skills that are non-standard.

2.2. Digitalization, automation, and job market outcomes

Frey and Osborne's (2017) study made the first estimates placing the number of high-risk jobs at 47% of the employed US workforce. Other studies suggest that while job automation displaces workers, at the aggregate level, it reshapes jobs (Acemoglu & Restrepo, 2020). Digital banking rationalizes branches and activates the downsizing of routine roles, while job roles in banking shift towards higher-value tasks (Vives, 2019). The World Economic Forum (2023) forecasts that while globally automation will displace 85 million jobs, 97 million jobs will be created in fields such as technology and data, as well as in AI.

Employment polarization refers to the growing distribution of high-skill and high-wage jobs and the elimination of middle-skill routine jobs (Autor, 2015; Bonfiglioli et al., 2025). This phenomenon is reflected in banking with the growing need for data scientists, AI engineers, and security specialists along with the growing need for frontline customer service, while the demand for middle-skill jobs is in decline (Bessen, 2019). Other studies that utilize data from the Pakistani banking industry argue that automation will drive the elimination of 25 to 30 percent of employment in routine jobs within the 2018-2024 period (Social Science Review Archives, 2024).

2.3. Automation, skills development, and workforce readiness

The digital economy requires workers to develop more hybrid skills that combine the technical, analytical, cognitive, and interpersonal skills (OECD, 2019). Autor, Levy, & Murnane (2003) showed that as the digital economy develops, employees need more non-routine analytical and interpersonal skills, and less routine cognitive and manual skills. Data entry is assigned to RPA systems, customer queries are solved by AI chatbots, and automated systems are used to process loan applications. As a result, employees need to develop new skills to manage, supervise, and fine-tune automated systems (Alles & Gray, 2020).

Brynjolfsson and McAfee (2017) argued that skill mismatch is a problem that concerns many employees and arises when the skills and competencies of employees do not match the requirements and skills needed to perform the newly created job positions. Automation leads to job insecurity and resistance from employees. Pakistan's digital transactions more than doubled from 1.1 billion in 2017 to 2.7 billion in 2023 (GCFI, 2024; SBP, 2025). Despite this growth, digital literacy is lagging, training programs are not sufficiently funded in relation to technology, and employees in non-urban areas lack access to meaningful and planned job reskilling (IPRI, 2024; Jabeen, Aakif, & Afridi, 2024).

2.4. Workforce adaptability and corporate training programs

Adaptability in the workforce has become an important variable in studying the relationship between digital transformation and the employment and performance results. According to Pulakos et al. (2000), adaptability is the ability to manage emergencies, learn new skills, embrace new challenges, and be interpersonally flexible. Adaptability also

illustrates the Human Capital Theory as a flexible meta-competency which permits the worker to develop and refine new and relevant skills as the requirements in a given field change (Becker, 1993). Van Laar et al. (2020) provided empirical evidence showing workforce adaptability as a mediator between digital exposure and the retention of employment.

The most immediate way an organization can manage the impacts of digitalization of skills is through their training programs. Evidence presented by Battisti, Belloc, and Del Pino (2022), suggests that in developing economies, the positive impacts of digitalization are increased by having a structured means of training in the organization. The most important finding of a Pakistan specific study was that even well-planned training programs remain ineffective without the building blocks of an organizational infrastructure such as performance management systems, supervisory skill development, and institutional incentives that reward the use of new skills (Annals of Social Science Review, 2024).

2.5. Research gap

Although evidence is accumulating, little empirical research has characterized the interaction of digitalization, automation, workforce adaptability, corporate training, and employment outcomes in the banking sector of Pakistan. Automation and digitalization have been studied predominantly in advanced, high-income economies with little research addressing the interlinked effects of digital transformation in the banking sector, workforce, and automation in low and middle income economies (Bai & Sarkis, 2020; Essuman et al., 2022). Research of this kind addressing the specific context of Pakistan's hybrid dual Islamic–conventional banking system, its unique regulatory and demographic profile, and its digital infrastructure monopolies will help facilitate evidence-based policy and practice.

3. Data and variables

3.1. Data sources and sample

This study uses strategies from concurrent triangulation mixed-methods studies. Integrated during the interpretation stage, the study simultaneously collects quantitative survey and qualitative interview data. For the quantitative part, a self-structured survey written by the researcher and comprised of closed-ended questions was administered to a stratified random sample of banking employees along the Islamabad – Rawalpindi corridor. Stratified random sampling was used to demonstrate the different types of banks (conventional and Islamic), the ownership structure (public and private), and the different bank locations (urban, rural, and semi-urban). This type of sampling was necessary due to the study's interest in comparing Islamic and conventional banks, which is one of the major gaps in the existing literature.

The survey was distributed to 399 individuals, and the survey was completed in its entirety by 383 individuals, indicating a response rate of 95.99 percent. In total, 384 participants were needed, determined through the Cochran (1977) formula regarding large populations ($n = Z^2 \times p(1-p) / e^2$; $Z = 1.96$, $p = 0.50$, $e = 0.05$). Sixteen completed surveys were excluded from analysis due to incomplete survey responses. Data on the demographics of the research sample, (N=383), is presented.

Table 1

Demographic Profile of the Sample (N = 383)

Variable	Category	Frequency (%)
Gender	Male	201 (52.5%)
	Female	182 (47.5%)
Age Group	18–25 years	61 (15.9%)
	26–35 years	131 (34.2%)
	36–45 years	128 (33.4%)
	46 years and above	63 (16.4%)
Bank Type	Public Sector Bank (NBP, FWB)	58 (15.1%)
	Private Conventional Bank (HBL, UBL, MCB)	139 (36.3%)
	Full-Fledged Islamic Bank (Meezan, BankIslami)	129 (33.7%)
	Islamic Window of Conventional Bank	57 (14.9%)
Job Department	Frontline/Operations (Teller, CSO)	99 (25.8%)
	Middle Management (Branch/Ops Manager)	98 (25.6%)
	Back-Office/Administrative	94 (24.5%)
	IT & Digital Services	92 (24.0%)
Work Experience	Less than 2 years	59 (15.4%)
	2–5 years	155 (40.5%)
	6–10 years	111 (29.0%)
	More than 10 years	58 (15.1%)
Branch Location	Major Urban Centre (Islamabad, Rawalpindi)	202 (52.7%)
	Rural / Semi-Urban Area	181 (47.3%)

3.2. Variables

The model established four variable categories. First, using a five-point Likert scaled survey items, Digitalization and Automation serve as the model's Independent Variables. DM and JS comprise the model's dependent variables and capture among other things the perceived risk of job loss and transformation, the creation of new jobs, and new employment opportunities. Digital skills and competencies, data analytics, cybersecurity, and soft skills are also captured. Workforce Flexibility serves as the model's Mediating Variable, while Corporate Training serves the model's Moderating Variable. A five-point Likert scale was used for the model's survey items. The survey items of the model were based on the works of Pulakos et al. (2000), Nedelkoska and Quintini (2018), and Acemoglu and Restrepo (2020).

3.3. Empirical models

Two multiple regression analyses were used to evaluate direct effects:

$$\text{Model 1: JM} = \beta_0 + \beta_1(\text{DZJ}) + \beta_2(\text{AMJ}) + \varepsilon$$

$$\text{Model 2: SD} = \beta_0 + \beta_1(\text{DZS}) + \beta_2(\text{AMS}) + \varepsilon$$

To evaluate hypothesis 3, the mediating role of workforce adaptability, PROCESS Macro Model 4 (Hayes, 2022) was used with 5,000 bootstrapped samples to compute bias-corrected 95% confidence intervals. To evaluate hypothesis 4, the moderating role of corporate training programs was assessed with PROCESS Macro Model 1, where the interaction term ($\text{AMS} \times \text{CTP}$) was added to the regression. Before evaluating these hypotheses, all classical regression assumptions, such as linearity, homoscedasticity, normal distribution of the residuals, and multicollinearity through VIF, were confirmed to be satisfied.

4. Empirical results

4.1. Regression analysis: direct effects on job market impact

The first regression model examines whether digitalization (DZJ) and automation (AMJ) jointly and independently predict job market impact (JM). Table 2 presents the results.

Table 2

Regression Analysis — Predictors of Job Market Impact (N = 383)

Predictor	B	SE	β	t	p	VIF
(Constant)	-1.793	1.224	—	-1.465	.144	—
Digitalization (DZJ)	.308	.035	.320	8.903	< .001	1.012
Automation (AMJ)	.601	.035	.609	16.959	< .001	1.012
R = .718 R ² = .515 Adjusted R ² = .513 F(2, 380) = 201.914 p < .001						

Notes: VIF < 10 confirms absence of multicollinearity. *, **, and *** indicate two-tailed significance at the 10%, 5%, and 1% levels, respectively.

The complete model captures perceived job market impact with high statistical significance, $F(2, 380) = 201.914$, $p < .001$, and explains 51.5% of the variance, ($R^2 = .515$, Adjusted $R^2 = .513$). The positive association is confirmed with a multiple correlation coefficient of $R = .718$. Certainly, 51% of variance explained by two theory driven predictors is an outstanding positive association.

AMJ is the most powerful predictor of job market impact of the two. The results point clearly to the impact of RPA, AI chatbots, automated bank tellers, etc. Rapid and clear restructuring of job functions occurs when technology that solves a task moves front line and clerical staff. The first impacts of automation are felt in the labor market rather than the perceived, distant impacts of the digitalization that occurs later and more gradually.

DZJ has a substantial positive impact on job market impact, and is independent of AMJ. Its impact, while notable, is approximately half that which is attributable to automation. The digital banking of the near future, the integration of the cloud with banking settlement systems, and the rapid adoption of AI and analytics, etc. will, inevitably, reshape banking and change the skills and jobs at every level in the banking system. The absence of Multicollinearity is further confirmed by the VIF values of 1.012 for each of the two predictors, each well below the cutoff of 10.

4.2. Regression analysis: direct effects on skills development

The second regression model examines whether digitalization (DZS) and automation (AMS) significantly predict skills development (SD). Results are presented in Table 3.

Table 3

Regression Analysis — Predictors of Skills Development (N = 383)

Predictor	B	SE	β	t	p	VIF
(Constant)	-2.907	1.098	—	-2.647	.008	—
Automation (AMS)	.596	.033	.608	18.034	< .001	1.044
Digitalization (DZS)	.347	.033	.357	10.593	< .001	1.044
R = .766 R ² = .586 Adjusted R ² = .584 F(2, 380) = 269.223 p < .001						

Notes: VIF < 10 confirms absence of multicollinearity. *, **, and *** indicate two-tailed significance at the 10%, 5%, and 1% levels, respectively.

This model is more powerful than the job market impact model. Model statistics show significance ($F(2, 380) = 269.223$, $p < .001$), and the model accounts for 58.6% of skills development. ($R^2 = .586$, Adjusted $R^2 = .584$, $R = .766$). Compared to the previous model which accounted for job market impact (51.5%), this model accounts for higher levels of skills development (58.6%). This shows the direct effects of digitalization and automation on the demand for skills are more clear and stronger than the effects of digitalization and automation on changes in the job market.

Predictably, the main variable facilitating skills development is Automation ($\beta = .608$, $B = .596$, $t = 18.034$, $p < .001$, 95% CI [.531, .661]). Routine Data Entry tasks are being automated, Customer Support is being handled by AI, and a fully automated Loan Processing System is being introduced. Banking staff will have to learn skills to manage and monitor new systems. Automation of tasks does not eliminate employment in that field, but does raise the lower boundary of skills required to sustain employment in that field. This highly supports the Routine Bias and Technical Change Theory (Autor & Dorn, 2013). This theory states that automation replaces Routine Cognitive and Manual Tasks and positively complements and increases the employment of skills that are non-routine and Interactive.

Digitalization positively influences skills development ($\beta = .357$, $B = .347$, $t = 10.593$, $p < .001$, 95% CI [.282, .411]). Digitalization, in a systemic way, alters the skills landscape. Employees who once excelled in delivering services in person, now require, digital communication skills, digital data skills, and digital banking skills. This is in line with Human Capital Theory (Becker, 1964): digitalization represents new payoffs to new skills, creating new incentives for employees and Institutions to engage in Human Capital Development activities.

4.3. Cross-sectional analysis

The study shows that digital transformation can be experienced differently at various levels within an organization. For example, this can range from the operational staff member who would be dislocated from their position by the implementation of AI chatbots and Automated Teller Machines (ATMs), to the data analyst staff member who would possess the skills that are increasingly required by the banks in Pakistan. The demographics surveyed in this study are also fairly distributed by the different banks in Pakistan. These include private conventional banks (36.3%), full-fledged Islamic banks (33.7%), public

sector banks (15.1%), and Islamic windows (14.9%). Given this study's aims to assess whether Shari'ah-compliance restrictions would "moderate" the adoption of automation, the Islamic banks' employees would be of particular interest. In contrast to the other countries, this would be a feature of Pakistan's dual-banking system. The fairly equal urban-rural demographic representation (52.7% vs. 47.3%) enables drawing relevant conclusions on the varying experiences of digital transformation along the urban vs. rural divide. This would also represent the study's key analytical contribution.

4.4. Mediation analysis: workforce adaptability

Hypothesis H3 posited that workforce adaptability mediates the relationship between digitalization and skills development. PROCESS Macro Model 4 (Hayes, 2022) was employed with 5,000 bootstrap samples. Results are presented in Table 4.

Table 4

Mediation Analysis — Workforce Adaptability as Mediator (DZS → WFA → SD)

Pathway	B	SE	t	p	LLCI	ULCI
Path a: Digitalization → Workforce Adaptability	.3415	.0431	7.928	< .001	.2568	.4262
Path b: Workforce Adaptability → Skills Development (controlling DZS)	.1873	.0510	3.672	.0003	.0870	.2875
Direct Effect: Digitalization → Skills Development (controlling WFA)	.4037	.0463	8.724	< .001	.3127	.4947
Total Effect: Digitalization → Skills Development	.4677	.0436	10.733	< .001	.3820	.5534
Indirect Effect (via WFA): B = .0640, BootSE = .0195, BootLLCI = .0267, BootULCI = .1027 — CI excludes zero: partial mediation confirmed						

Notes: Bootstrap samples = 5,000. Indirect effect confidence interval excludes zero, confirming statistically significant partial mediation. Proportion of total effect mediated ≈ 13.7%.

The mediation analysis shows a statistically significant pathway on how digitalization affects skills development through workforce adaptability. Path a shows that digitalization predicts workforce adaptability ($B = .3415$, $t = 7.928$, $p < .001$) with 14.16% of the variance of the mediator. Path b shows that workforce adaptability predicts skills development even when digitalization is accounted for ($B = .1873$, $t = 3.672$, $p = .0003$). With a bootstrap 95% CI of [.0267, .1027], there is a significant partial mediation as zero is not included. The total effect being mediated is 13.7%.

The mediation being partial is an important consideration. Digitalization affects the development of skills in a direct and indirect manner simultaneously. Digitalization directly creates a demand for new skills and indirectly stimulates the exposure for new skills, by enhancing employees' adaptability. Psychological and behavioral initiatives that strengthen employees' readiness to adapt may have an independent effect on skills development, in addition to the skills development that digitalization drives.

4.5. Moderation analysis: corporate training programs

Hypothesis H4 predicted that corporate training programs moderate the relationship between automation and skills development. PROCESS Macro Model 1 (Hayes, 2022) was used. Results are presented in Tables 5 and 6.

Table 5

Moderation Analysis — Corporate Training Programs as Moderator (N = 383)

Predictor	B	SE	t	p	LLCI	ULCI
(Constant)	-11.340	5.077	-2.234	.026	-21.323	-1.357
Automation (AMS)	.8604	.1994	4.315	< .001	.4683	1.2524
Corporate Training Programs (CTP)	.8681	.2069	4.196	< .001	.4613	1.2748
Interaction: AMS × CTP	-.0171	.0078	-2.189	.029	-.0325	-.0017
R = .756 R ² = .572 Adjusted R ² = .569 F(3, 379) = 168.895, p < .001 ΔR ² = .005, ΔF = 4.792, p = .029						

Notes: Interaction term significant at $p < .05$ confirms moderation. ΔR^2 represents incremental variance explained by the interaction term beyond main effects.

Table 6

Conditional Effects of Automation on Skills Development at Values of Corporate Training Programs

Level of Corporate Training Programs (CTP)	CTP Value	Effect of Automation on SD	SE	t	LLCI	ULCI
Low (16th percentile)	22.00	.4838	.0472	10.249	.3910	.5766
Medium (50th percentile)	26.00	.4153	.0420	9.894	.3328	.4978
High (84th percentile)	29.00	.3639	.0519	7.009	.2618	.4660

Notes: Effect of automation on skills development remains positive and significant at all levels of CTP; the interaction captures a substitution effect, not a reversal.

Both main effects are significant. Automation ($B = .8604$, $p < .001$) and corporate training programs ($B = .8681$, $p < .001$) positively and independently predict skills development. The interaction term (AMS × CTP) is significant ($B = -.0171$, $SE = .0078$, $t = -2.189$, $p = .029$, 95% CI $[-.0325, -.0017]$), supporting H4.

The interaction coefficient's negative value indicates a substitution and a buffering effect, which is important to theory. When corporate training programs are low (low CTP), automation is the most important and most potent driver of skills growth (conditional effect = .4838). Employees learn new skills by tackling automated systems directly. On the other hand, when corporate training programs are high (high CTP), the bank is the major driver of skills growth (conditional effect = .3639, reduction of roughly 24.7%). The effect of automation on skills development stays positive and significant at every level of CTP. Hence, training programs don't eliminate automation's effect on skills development. They do progressively decrease reliance on automation as corporate training programs take on the role of skills development.

This substantiates Human Capital Theory (Becker, 1964). When an organization puts resources into developing their human capital, they have control over the transformation of skills. In Pakistan's banking sector, with the absence of rural branches, smaller banks, and Islamic banking entities, the impact of this theory creates a compounding

disadvantage. Employees in these organizations who get the least exposure to automation are the employees who get the least formal training.

4.6. Summary of hypothesis testing results

Table 7

Summary of Hypothesis Testing Results

H	Hypothesis Statement	Key Statistic	Decision
H1	Digitalization and automation significantly affect job market	$R^2 = .515$; DZJ: $\beta = .320$, $p < .001$; AMJ: $\beta = .609$, $p < .001$	Supported
H2	Digitalization and automation significantly affect skills development	$R^2 = .586$; AMS: $\beta = .608$, $p < .001$; DZS: $\beta = .357$, $p < .001$	Supported
H3	Workforce adaptability mediates digitalization $\rightarrow$ skills development	Indirect B = .064, Boot 95% CI [.027, .103]; ~13.7% mediated	Supported (Partial)
H4	Corporate training programs moderate automation $\rightarrow$ skills development	Interaction B = -.017, $p = .029$; conditional effects positive at all CTP levels but declining	Supported (Negative Moderation)

5. Conclusion

This research focused on how automation and digitalization affect outcomes in the labor market and skills in the banking sector in Pakistan. Workforce adaptability served as a mediating variable, while corporate training programs were the moderating variable. Four key findings were developed.

First, automation appears to have a much larger impact than its counterpart on both dependent variables ($\beta \approx .609$ for impact on the labor market; $\beta = .608$ for impact on skills) due to the task-level and direct impact on a concentrated workforce, compared to the broader, more systemic, and gradual impact on skills and institutional changes that are caused by digitalization. With automation, specialized task-replacement technologies have an immediate impact on skills and the workforce, whereas the effects of digitalization are diffuse and take years to be fully realized.

Second, automation and digitalization, combined, account for 51.5% of variance in perceptions of the labor market and 58.6% of variance in skills development matters, which is extremely high by social sciences standards. The fact that technologies account for a greater degree of variance in skills development suggests that, in the banking sector, employees perceive the skill requirements brought by digitalization much more directly than the structural changes in the labor market.

Third, workforce adaptability partially mediates the digitalization–skills development relationship (indirect B = .064, Boot 95% CI [.027, .103]), explaining 13.7% of total effect. The primary model shows that digitalization influences the development of skills indirectly, as digital technology increases employee adaptability, which stimulates skills development and progress and development of skills. This study finds adaptability measurable in human capital and direct implications in change management, not just a soft HR goal.

Fourth, corporate training programs negatively impact the automation–skills development nexus ($B = -.0171$, $p = .029$). High-training institutions are attributed automation less as a skills-builder, because systematic institutional training eventually fills the skills-development gap. This substitution effect, seen from the organic, need-based approach and substitute planned institutional control, reveals severe equity consequences for Pakistan's rural banking workforce and Islamic banking institutions, which are doubly disadvantaged because of low automation and inadequate training.

Collectively, these findings develop Human Capital Theory (Becker, 1964) and Theory of Technological Disruption (Christensen, 1997) within the context of Pakistan's Islamic–conventional banking system. They are contextually relevant for the IMF (2025) and the State Bank of Pakistan's National Financial Inclusion Strategy 2024–28 for the workforce-sensitive dimension of digital banking policy. Suggested mandatory digital banking licenses with workforce transition plans, an obligation to report workforce digitalization annually, a national digital skills framework for banking designed in collaboration with the Pakistan Institute of Banking, and targeted rural digital skills training to mitigate the coexisting disadvantage of employees in the most infrastructure-challenged banking areas of Pakistan.

Declaration of Competing Interest

The author declares no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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