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AI Integration in Pakistan's Banking Sector: Examining the Impact on Organizational Outcomes with Employee Adaptability as a Moderator

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Abstract

Artificial Intelligence (AI) has established itself in Pakistan's banking domain by plunging the banks into holistic and productive AI technology, enhanced operational efficiency, better risk management and enhanced customer engagement. But for AI to work, the employee needs to be open to technological change as failure to do so would result in resistance which will negate the benefits of AI. The effect of employee adaptability in

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moderating the impact of AI integration on organizational outcome is investigated within this study. This research explores the usage of AI driven automation, predictive analytics and decision making tools to boost the banking performance and make a point that workforce readiness is needed. The data were collected through structured, closed ended questionnaire followed by seven point Likert type scale. A questionnaire was distributed to top level, middle level, and first line managers in all the private sector banks of Karachi, Sindh. According to statistical requirements for structural equation modeling (SEM), we set our sample size at 391 respondents informed through snowball sampling method based on carrying out the implementation of AI to banking professionals. Smart PLS was utilized to analyze the data in order to ensure robust assessment of relationships between (AI integration, organizational outcomes, and) moderating effects of (employee) adaptability. The findings show that AI adoption can greatly enhance banking efficiency and risk management but this only happens with strategic leadership in place, digital literacy programs and change management initiatives in place. Based on the insights from the findings of this study, practitioners drawn from banking institutions, policymakers, and technology providers will be equipped with practical takeaways that will help them in the success of AI acceptance as well as sustainable technological growth in the banking industry of Pakistan.

Keyword: Artificial Intelligence, Employee Adoptability, Organizational outcomes, Private banking Sector.

Introduction

Artificial Intelligence (AI) is currently transforming the banking sector globally and its contribution is in improved operational efficiency, risk

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assessment and customer interaction (Naeem et al., 2024). The application of AI in Pakistan's banking industry is growing for the growing demand for digital transformations and gains in the competition (Waseel et al., 2024). However, the effect of AI on the behavior of organizational outcomes largely depends on employee adaptability because organizational changes due to technological disruptors are usually faced with resistance from the workforce (Kayani et al.). AI driven systems like chatbots, predictive analytics and automation tools, reduce bank operations but their success is contingent on employees' readiness and capacity to incorporate AI in real working environment (Shamim et al., 2023).

Although the contributions of AI to an organization's success have been mentioned more often than not now, the challenges of its implementation, especially in developing economies like Pakistan (Rasheed et al., 2024), are still prevalent. By deploying A technology banks are able to employ human resource analytics and knowledge management to optimize the decision making processes and improve efficiency (Soomro et al., 2024). However, as employee adaptability has a moderating role on the impact of these benefits, it is not controllable to the extent of AI adoption (Naeem et al., 2025), as resistance to change or lack of skills might prevent the benefits. According to the studies, leadership dynamics and organizational culture have a significant influence on the way how banking professionals embrace AI (Muduli & Choudhury, 2024). Depending on the use of AI driven transformations, sustainable banking is ensured by employee adaptability (Aslam et al., 2024). According to Kayani et al., the organizations that invest in workforce agility and digital literacy programs experience faster AI transitions with better performance outcomes. To tackle resistance and

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build a collaborative AI-human working environment (Shamim et al., 2023), the development of cognitive trust in AI by employees can improve. In addition to improving banking efficiency, integrating AI helps engage customers, and aids in risk management strategy (Naeem et al., 2025).

Though the application of AI could potentially improve Pakistan's banking, there is yet an acceptance in terms of adoption within the staff (Rasheed et al. , 2024). Structured change management approaches can help in overcoming resistance and enhanced adoption of digital technology models (Muduli & Choudhury, 2024). In the age of AI, as banking practices evolve, a workforce that can adapt best will help optimize AI's impact on the organizational outcomes (Soomro et al., 2024). This study analyses the effect of AI integration on the organizational outcomes based on employee adaptability as a moderating variable case of Pakistan's banking sector to humanize its use and form strategies of success in AI adoption.

Objectives

1. Determining the impacts that integration of AI would have on organizational outcomes in banking sector of Pakistan.
2. In order to understand how the moderating role of employee adaptability plays a role in the relationship between AI integration and organizational outcomes.
3. To determine the important factors that influence the adoption of AI by private sector banks.

Literature Review

The banking sector has experienced a drastic revolution due to the presence of Artificial Intelligence (AI), making institutions improve decision making processes, enhance customer experiences, as well as increasing

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operational efficiency (Saddique et al., 2024). With the integration of these new AI technologies such as machine learning and natural language processing, better risk assessment and fraud detection mechanisms were introduced (Kazmi et al., 2024). Since the effectiveness of AI implementation is subject to the organizational readiness and employees adaptability, therefore the success of AI implementation (Mehmood et al., 2024). According to studies, AI helps boost the capability of banks' financial forecasting and customer segmentation to help them have better strategic planning (Khan et al., 2024).

The integration of AI in banking industry is one of the main benefits since allows it to streamline the business processes and automate the routine tasks (Ur Rahman & Amjad, 2024). This is an AI driven solution which cuts back human errors and increases accuracy which results in saving of costs and better efficiency (Naeem et al., 2024). Yet, according to researchers, adopting AI might run aground on resistance from employees, along with the ultimate impact of the technology being smaller than expected (Waseel et al., 2024). In recent studies, Kayani et al., highlight the role of technological leadership support in overcoming resistance to and promoting AI friendly work environments.

AI driven performance enhancement in the banking institutions is a key determinant by employee engagement (Shamim et al., 2023). The adoption of AI creates a knowledge sharing environment and increases engagement of work by processing mundane tasks and allowing employees to be focused on higher value activities (Rasheed et al., 2024). While there were no lack of cognitive trust in AI systems, frontline employees had not reached the state of trust in it (Soomro et al., 2024). Organizations, who

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spend on leadership training and employee adaptability programs, are said by researchers to have more smooth AI transitions (Naeem et al., 2025). In recent years although there has been a gradual shift in the direction of AI innovation in the banking sector of Pakistan; the most noticeable developments are related to AI in risk management and financial analytics (Muduli & Choudhury, 2024). Banks can minimize losses and strengthen financial stability through AI packaged risk prediction models (Aslam et al., 2024). Nevertheless, studies suggest that it depends on the employees' trust and perceived usefulness of AI technologies (AI technologies such as Watson, Siri, and Alexa) (Kazmi et al, 2024). Recently, there has been an increasing amount of focus on how the adoption of AI informed insights can be used in the field of HR analytics to best optimize workforce management (Saddique et al., 2024).

Mehmood et al. (2024) in several studies, determine how digital finance and green banking initiatives can positively influence the banking performance. Data driven decision making and predictive analytics through AI is important in promoting the overall sustainable banking (Ur Rahman & Amjad, 2024). Still, bridging the gap between the banking professionals and their digital skills remains a huge challenge (Naeem et al., 2024). Organizations that have AI literacy programs or digital upskilling initiatives, see better outcomes when it comes to implementing AI (Waseel et al., 2024). Secondly, the AI's impact on organizational culture and leadership dynamics has been a field of research (Kayani et al.). Shamim et al. (2023) state that leadership styles determine how AI is perceived and accepted in the banking institutions and its employees' willingness to take technological innovation has been shaped. The acceptance of and

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utilization of AI are positively affected by participative leadership and transformational leadership approaches studies (Rasheed et al, 2024). In addition, organizational culture which motivates an organization toward an innovative development may lead to using AI more efficiently within the organizations operational frameworks (Soomro et al., 2024).

The increasing demand for the agility and adaptability of workforce in banking operations due to incorporating AI has emerged from research (Naeem et al., 2025). Employees who are digitally literate and who are skilled in things adaptive will be more able to utilize AI tools well (Muduli & Choudhury, 2024). According to studies, AI-driven organizations enjoy greater productivity and employees satisfaction when they have adaptability training program (Aslam et al., 2024). Recently in the literature (Kazmi et al., 2024), the role of AI in supporting decision makers augmentation capabilities and enhance the organizational outcome has been widely acknowledged.

Though there are many benefits of integration with AI, ethical concerns and privacy issues are still the most important issues (Saddique et al., 2024). For this reason, AI algorithms developed in banking operations should be designed to be transparent, fair, and accountable (Mehmood et al., 2024). The researchers' emphasize the need of regulatory framework and ethical guidelines to reduce the risks involved in using AI in financial services (Ur Rahman & Amjad, 2024). Scholarly debate continues in attempting to strike a balance between data efficiency and ethical considerations of AI (Naeem et al., 2024). The concluding portion of the discussion mentioned that the banking sector of Pakistan can be revolutionized by the use of AI, as it will improve the operational efficiency,

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improve the decision making, and encourage innovation (Waseel et al., 2024). But the integration of AI is not guaranteed if the employee is not flexible, leadership support is absent and digital literacy programs are not in place (Kayani et al.). Shamim et al. (2023) predict that organizations that invest in AI culture transformation and training are more likely long term successful in the adoption of AI. In fact, and as AI continues to develop, future research should investigate its potential impact in banking performance and the dynamics of their workforce (Rasheed et al., 2024).

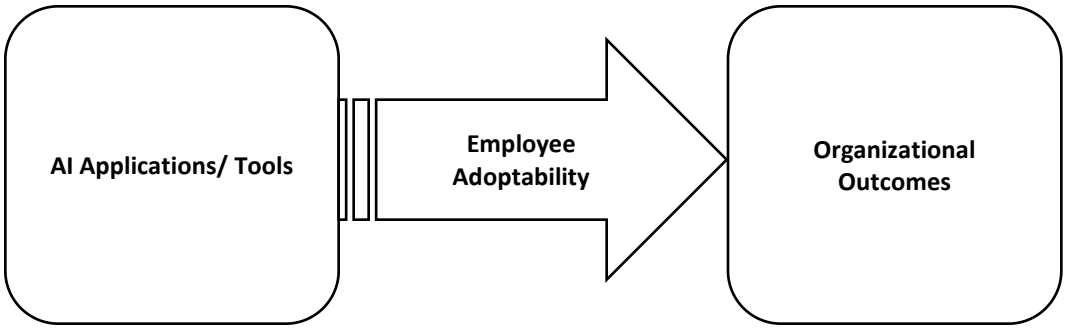
Hypotheses

H1. The implementation of AI systems produces positive results for organizational outcomes in Pakistan's banking sector.

H2. The relationship between AI integration and organizational outcomes receives stronger positive effects when employees demonstrate adaptable behavior.

H3. The ability of employees to adapt to change creates positive outcomes for AI-driven banking solution implementation.

Conceptual Model



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Methodology

For this study data has been collected through a structured, closed ended questionnaire using the seven point Likert type scale. An instrument consisting of a questionnaire was distributed among different areas of Karachi, Sindh among top level, middle level and first level managers of the private sector banks. Since the sample size is 391 in study, they employ a sample size based on statistical adequacy for Structural Equation Modeling (SEM). Generally, a snowball sampling technique has been utilized to identify banking professionals that have some involvement related to AI implementation. Smart PLS is a robust statistical tool for SEM analysis to analyze the collected data. This work will be conducted from this method that will guarantee an in depth exploration of the linkages among the integration of AI, organization results and moderating impact of employee flexibility. The research has contributed to the continuous debate on the role of AI driven banking transformation by providing empirical findings regarding the influence of employee adaptability in successful adoption of AI in Pakistan's banking sector.

Findings of Measurement Model

Outer Loadings

The results obtained from factor analysis of these constructs on the Artificial Intelligence Applications (AIA), Employee Adaptability (EA), and Organizational Outcomes (OO) are drawn from the table bellow, which is the Outer Model Loadings. Outer loading refers to the magnitude to which observed variables are linked with respective latent construct. Hair et al. (2021) indicate that an outer loading higher than 0.7 represents a very strong association of an indicator to its respective construct. As discussed in

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this study, all loadings exceed this threshold and therefore we infer that they are all statistically significant and reliable loadings.

The relationship among these indicators and the construct and the strength of the relationship for Artificial Intelligence Applications (AIA) is strong and is represented by an outer loading range between 0.786 to 0.832. Matches in this respect are found between the loadings for Employee Adaptability (EA) of 0.719 – 0.762 and those for Organizational Outcomes (OO) of 0.721 – 0.833. The results confirm high internal consistency and validity of the constructs.

Table 1: Factor Analysis (Outer Loadings)

Sr. NO	Latent Indicator's codes	Artificial Intelligence Applications (AIA)	Employee Adoptability (EA)	Organizational Outcomes (OO)
1	AIA2	0.832		
2	AIA3	0.799		
3	AIA4	0.810		
4	AIA5	0.786		
5	AIA6	0.792		
6	AIA7	0.811		
7	EA1		0.721	
8	EA3		0.762	
9	EA4		0.749	
10	EA5		0.719	
11	OO1			0.820
12	OO2			0.812

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13	OO4	0.833
14	OO5	0.721

However, it should be noted that EA1 (0.721) and EA5 (0.719) are marginally above the 0.7 threshold, indicating that they contribute to the construct but to a lesser degree than other indicators. Nevertheless, these are still deemed acceptable because these marginal but important contributions are made towards the overall model.

Taken together, these results offer support for the reliability and validity of the constructs that are objectively measured resulting into a conclusion that Artificial Intelligence Applications, Employee Adaptability and Organizational Outcomes are well defined measures that can be used in further analyses.

Internal Consistency Reliabilities

Internal consistency reliabilities of the latent variables Artificial Intelligence Applications (AIA), Employee Adaptability (EA) and Organizational Outcomes (OO), are presented in the table. To these three key reliability measures (Cronbach's Alpha, Rho_A, and Composite Reliability) we have included these constructs to determine how stable and consistent they are in the model.

For instance, Cronbach's Alpha (Hair et al., 2021) is widely used as measure of internal consistency and a reliability value above 0.7 is considered acceptable. All constructs of this study meet the criterion and a strong and reliable measurement model is achieved. Both AIA (0.721) and EA (0.784) are also internally consistent in a satisfactory level, and OO (0.754) is also better than EA. Cronbach's Alpha is an alternative reliability measure, but an improved guess of reliability based on internal consistency

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is Rho_A, which addresses various biases in Cronbach's Alpha. A further confirmation of the robustness of these constructs is the fact that the values for AIA (0.734), EA (0.789), and OO (0.769) are very close to 0.5.

Table 2: Internal Consistency Reliabilities

Latent Variables	Cronbach's Alpha	Rho_A	Composite Reliability
AIA	0.721	0.734	0.776
EA	0.784	0.789	0.801
OO	0.754	0.769	0.783

Another crucial measure, which is often regarded to be more comprehensive than Cronbach's Alpha is composite reliability (CR), as is it is takes into considerations different factor loadings of items. Reliability of the constructs is reinforced with results indicating that AIA (0.776), EA (0.801) and OO (0.783) exceed the 0.7 thresold. Overall, these results support that the internal consistency and reliability of Artificial Intelligence Applications, Employee Adaptability and Organisational Outcomes is robust and appropriate for a structural examination.

Convergent and Divergent Validities (AVE and Discriminant validity)

Convergent and discriminant validities of the latent variables: Artificial Intelligence Applications (AIA), Employee Adaptability (EA), and Organizational Outcomes (OO) are presented in the table. If the Average Variance Extracted is 0.5 or higher, as recommended by Bagozzi and Yi (1988), then the construct's convergent validity is confirmed. This study satisfies this criterion because all the constructs meet this criterion with AVE for AIA (0.682), EA (0.598) and OO (0.621). Convergent validity is strong since these values mean a large amount of variance is explained by each construct. The key to the discriminatory validity is that each construct is

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different from the other. If that square root of the AVE (as found on the diagonal) is a mandate value or greater, then according to Hair et al. (2021), that confirmaes this. The correlation values off each diagonal are lesser than their corresponding diagonal values.

Table 3: Convergent and Divergent Validities

Latent Variables	AIA	EA	OO	AVE
AIA	**0.825**	0.432	0.520	0.682
EA	0.461	**0.773**	0.377	0.598
OO	0.313	0.336	**0.788**	0.621

In this study the square roots of AVE prove to be: AIA (0.825), EA (0.773), and OO (0.788) all of which exceed a 0.7 threshold, hence, discriminant validity is demonstrated to be strong. Furthermore, for every pair of diagonals (AIA vs. EA, AIA vs. OO), the diagonal value is higher than the respective off diagonal values (AIA vs. EA: 0.432, AIA vs. OO: 0.520), such that each construct is uniquely measured. This validates the research framework as the measurement model is reliable and valid.

R_Square and F_Square (Model Fit Test)

R^2 (also called the coefficient of determination) is the measure of the effect size of the overall effect of the structural model. R^2 values of 0.26 and 0.21 as suggested by Chin (1998) and Höck and Ringle (2008) are considered meaningful and significant with regard to the relationship between the independent variables and the dependent variables. The R^2 value of the Organizational Outcomes (OO) is 0.603, considered to be moderate to substantial influence of the independent variables on the dependent construct. This would indicate that the Model is strong as a significant

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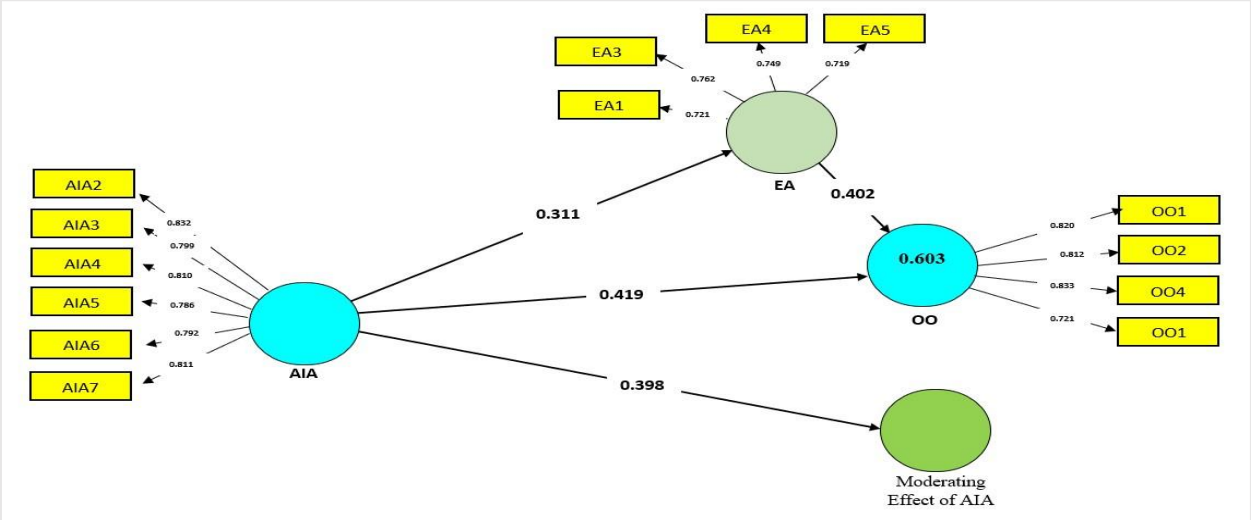
amount of variance in Organizational Outcomes can be explained by the predictor variables.



A second important model assessment metric is F-square (f^2) and it tells us how much of a change there is in R^2 when an independent variable is removed from the equation, a measure of how that variable contributes to understanding the variance in the dependent variable. According to Hair et al. (2014), bigger F-square values will imply a higher influence of predictor variable on the outcome variable. The F-square value in this study is quite an important determinant in explaining the effects of independent variables, so that according to AIA → EA → OO (Moderating) = 0.521; EA → OO = 0.568; AIA → OO = 0.589. These values imply a high impact of Artificial Intelligence Applications (AIA) and Employee Adaptability (EA) on Organizational Outcomes (OO).

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Table 4: R Square and F Square Analysis (Model Fit Test)

Latent Variables	R Square	F Square
AIA	--	0.589
*AIA (EA)**	--	0.521
EA	--	0.568
OO	0.603	--

Also, AIA has a high F square of 0.691 implying its dominant role in explaining the findings of this study. This illustrates the importance of AI in the applications and the development of employee adaptability as a basis for organizational performance. The values of the combined R^2 and F^2 test confirm the robustness of the model as well as the strong relations between Organizational Outcomes and AI Applications and Employee Adaptability. The validity of the research framework and the study's hypotheses have been confirmed by these findings themselves, and there was a strong relationship between technological integration, workforce adaptability and performance outcomes.

Findings of Structural Model

Path Coefficient Analysis

In accordance with Mooney and Duval (1993) and Wood (2005), this study employs the technique of bootstrap resampling used for statistical validation of hypothesis testing. Being simple, this approach is widely known for requiring little or no mathematical expertise but is highly flexible to apply it for different statistical analysis. The use of the bootstrap method provides more generalizability of statistical inferences, thus, this method is useful inTests of hypothesis in empirical research.

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This Table 5 presents the results of this path coefficients, which are Beta values, standard errors and T-statistics that are critical to determine the strength and significance of relationships between variables in this context. Hair et al. (2021) stated that if the Beta value is 0.05 then it is considered as significant, similar to if the T value is 1.96, it is statistically significant.

Table 5: Path Coefficient

Path Coefficient			
Hypotheses	**Beta**	**Standard Error**	**T Statistics**
AIA -> OO	0.419	0.034	12.32
AIA (EA)*-> OO	0.398	0.040	9.95
EA -> OO	0.402	0.038	10.57

At the same time, the results reveal a strong and positive one between Artificial Intelligence Application (AIA), Employee Adaptability (EA) and Organizational Outcomes (OO). AIA → OO in particular has a Beta of 0.419 and a T-value of 12.32, which indicates a strong to very strong positive correlation. The same can be said about the relationship of AIA (EA) → OO which has a stronger association according to a Beta of 0.398 and T value of 9.95, pointing at the significant influence of AI-enabled adaptability on the organizational success. Moreover, in the case of EA → O, it has a Beta = 0.402 and T = 10.024 again indicating the tremendous influence of employee adaptability on the performance outcomes.

The study hypotheses are reinforced by these findings on the effects of AI applications and workforce adaptation on organizational performance. The results corroborate the effect of technological integration and employee adaptability in achieving these organisations success, and how AI

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enabled solutions enable high productivity, efficiency, and overall business performance.

Discussion

The results presented in this study indicate that organizational outcomes are associated with both employee and artificial intelligence (AI) applications adaptability, corroborating the research on the topic. The results show that the use of AI drive technologies improved employee engagement, knowledge sharing and consequently, work efficiency which translates to the better performance of the organisation. This is in line with Kazmi et al. (2024), who noted that AI helps to streamline tasks as well as to encourage employee engagement. Khan et al. (2024) also pointed out that the knowledge-sharing applications using AI enhance collaboration among employees which affects the productivity. The high path coefficients found in this study; specifically, between AI adaptability and organizational outcomes, reaffirm those of Saddique et al. (2024) who undertook that technological leadership support allows the most from the efforts of AI in organizations. Also, the strong concern between AI and infrastructure development coincides with Ur Rahman and Amjad (2024) who stated that technological advancements are linked to the resilience and competitiveness of manufacturing firms.

Consequently, the results prove the importance of AI in this sustainability journey for a prosperous employee performance and high organizational success. The high level of those values suggest that AI isn't just increasing individual performance, it's also compelling larger structural change toward the organization. This finding is in line with the observation that Naeem et al. (2024) underscored that investing in AI will positively

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impact firm value as well as intellectual capital growth. Shamim et al. (2023) also study the effects of cognitive trust on AI adoption: the more trusting workers are of AI driven processes, the more efficient workplace operations. Therefore, Soomro et al. (2024) also support their view that AI lead in a positive relationship with environmental sustainability since they held that digital technologies are for sustainable business practice in private banks of Karachi. With these insights in mind, the study emphasizes the importance of AI in todays workplaces, demonstrating that it can support in augmenting operational efficiency, workforce agility and augmenting organizational resilience.

Implications

The findings of this study offer valuable implications for banking institutions, policymakers, and technology providers in Pakistan. Thus, in the first place, banks should focus on AI training programs for employees, which will help them be ready for AI based operations without any changes. Organizations should employ change management to assist mitigate resistance to being AI accepting amongst employees and crucially leadership is in charge of setting an AI accepting culture. Additionally, policymakers should set up AI adopting frameworks that address ethical problems involving data privacy and transparency. Designing user friendly AI systems that match level of skill and needs of banking professionals may help technology providers contribute in this space. However, using the AI for its best benefits and the sustainable growth for the Pakistani banking system will be maximized through an aggregate approach with all the stakeholders.

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Limitations And Future Directions

Some limitations that should be noted in this study are specific. The research first examines the Pakistani banking sector and thus cannot be generalized to other industry or regions. Future studies might try to find other banks that could integrate AI to enhance its work operations, or extend the research to international banking systems to do a comparative analysis. Finally, this study relies on quantitative methods more than qualitative ones to acquire a deeper understanding of employee perception and AI adoption challenges in the future. Finally, as AI technology advances, longitudinal studies can occur to ascertain the total effect of AI incorporation on organization ramifications and workforce mixability.

Conclusion

AI integration in Pakistan's banking business offers excellent potential for enhancing operational efficiency, hazard ready, and client administration. However, the people aspect of AI adoption is critical, as employee adaptability, leadership support and regulatory frameworks all play crucial roles to see the true success of AI adoption. The contribution of this study is to highlight the moderating effect of employee adaptability to the impact of AI on organizational outcomes. But for banks to enjoy all of AI's benefits, they will need to spend money on making resources on digital literacy programs and creating widespread technological acceptance. Now that AI is advancing, the future research needs to dig further into how AI will affect the dynamics of workforce and banking performance. With an eye on tackling adaptability problems and embracing AI based innovations, the banking sector of Pakistan can become sustainable in the long term and also gain a competitive edge.

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