Digital Leadership and Employee Performance in the Age of AI: A Comparative Study of Indian Banking Employees Using Machine Learning Approaches

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Abstract: Digital leadership has become a decisive factor towards the efficacy of the workforce in technology-oriented organizations especially in the fast-evolving banking environment in India. As tools of artificial intelligence (AI) and machine learning (ML) are being integrated in human resource analytics, leadership evaluation is changing an evaluation based on perception to a performance forecasting-based evaluation. This essay explores the impact of digital leadership practices on the productivity, motivation, and engagement of employees in the leading Indian banks like ICICI, HDFC, and SBI. Supervised ML algorithms-linear regression, random forest, and support vectors were used to analyze a dataset that comprised 200 records of employees and each employee had leadership ratings, digital adaptability scores, and performance indices. The findings of the correlation indicate that the data-informed decision-making, the ability to collaborate remotely, and adaptive communication are the digital leadership qualities that explain almost 68 percent of the variation in measures of employee performance. Natural language processing (NLP) sentiment analysis of 5,000 textual employee feedback entries has shown that the sentiment index is positive at 0.72, which emphasizes the high level of emotional alignment of employees operating on the digital and artificial intelligence (AI)-based leadership. Based on the data comparison, Banks that utilize AI HR tools have reported a productivity increase of 15 – 18 times and a decrease in turnover rate by 12 times, compared to banks that use traditional methods of leadership. The positive AI's potential value as a core component of managerial and leadership style aimed at strengthening employee commitment and organizational cohesion is further substantiated.

Keywords: Artificial Intelligence; Digital Leadership; Banking Sector; Regression Analysis; Workforce Productivity; Employee Performance; Feature Importance; Digital Transformation; Random Forest; Data-Driven Decision Making.

1. INTRODUCTION

The revolution of technology has changed how every leader in today's organizations work, particularly in dependent fields such as banking and finance. The traditional model was built on power and control, whereas digital leadership focuses on merging tech, data, and adaptive communications within the organizational strategy [1]. Such a change in leadership models has been a direct

P. Johri et al. (eds.), *Proceedings of the International Conference on Sustainable Computing and Artificial Intelligence (ICSCAI 2025)*, Advances in Engineering Research 298,
https://doi.org/10.2991/978-94-6239-674-6_38

result of the influences of artificial intelligence (AI), machine learning (ML) and automation, all of which have changed the manner in which leaders engage with their teams, the manner in which decisions are made, and the way employees are motivated [2]. Digital leadership focuses on tech, culture, agility, and empowerment as the tools to drive leaders, using digital engagement, to enhance employees and optimize towards the hyper-competitive shifts in the marketplace [3]. The example of the banking industry in India is where the practices of such banks as ICICI Bank, HDFC Bank, and the State Bank of India implement AI-based analytics at the customer service, human resource management, and operational efficiency model. In this digital ecosystem, the effectiveness of leaders is becoming more dependent on the capability of a leader to use the available data to aid in decision-making and create a culture that allows employees to be motivated and committed to the organizational objectives [4].

The impact of employees on organizational performance, which is one of the fundamental conditions of organizational success, is no longer estimated by referencing to the traditional key performance indicators (KPIs) but to a wide range of digitally measurable qualities such as adaptability, innovation, and cooperation via virtual platforms [5]. Digital leadership can therefore be viewed as a combination of both technologic skills and anthropocentric leadership. Digital fluency leaders, characterized by the ability to comprehend, apply, and use digital technologies, were more likely to develop a more productive, innovative, and strong workforce [6]. Such leadership styles are important in the Indian banking environment, where competition is on a never-ending rise and the demands of customers are always growing. For instance, ICICI Bank's use of AI-enabled HR analytics will help leaders predict turnover, track engagement, and tailor development opportunities, resulting in increased organizational loyalty and decreased turnover [7]. These systems integrate various types of big data, both structured and unstructured, including performance metrics, employee sentiment from internal surveys, and online communication tools. If interpreted effectively, such data would make leadership more predictive than purely experiential.

2. RELATED WORKS

Banking organizations are reorganizing the work, performance evaluation, employee training, retention and resilience through artificial intelligence (AI), machine learning (ML), analytics-driven leadership, and digital transformation. Four significant themes can be identified in the recent literature: (i) AI as a source of productivity, fraud prevention, and service quality in the banking sector; (ii) employee preparedness, perception, and engagement in the AI-based leadership; (iii) digital leadership and organizational stability; and (iv) training and reskilling in an automated world. In combination, these themes outline a model of workforce in which increasingly data-based systems rather than human managers are defining how employees work and how they learn and are assessed [1]-[5].

A number of publications demonstrate that AI ceased to be an outsourcing in Indian and global banking- it is directly integrated into the working and employee processes. The applications of AI and ML in banks enable the automation of decision-making, enhance fraud identification, customize products, and enhance

the efficiency of the process, and consequently, redefine the job descriptions and requirements of workers [1], [14]. Concurrently, AI is framed as a resilience tool: those banks that developed AI more rapidly during the times of crisis (e.g. COVID-19) could continue their services, improve predictive decision-making, and coordinate remotely, resulting in more stable employee performance in the presence of external disruption [1],

Under this change, several researchers focus on the concept of employee readiness as an inhibitory or facilitating factor. Perceived usefulness, trust, transparency, and equity of the use of AI in evaluation and workload mediate its acceptance by the employees [5], . Indian banking staff, particularly younger generations (Gen Y and Gen Z), positively react to the properly designed features of AI within digital banking services and internal applications when such features are packaged as augmentation, rather than surveillance, and when there is high expectation-confirmation (i.e. the technology does as it promises) [5].

There is empirical and conceptual evidence supporting the notion that successful leaders in the age of AI must play an adaptive role between algorithms and employees: they must be able to make the outputs of analytics comprehensible to people, ensure psychological safety in more data-driven offices, and avoid over-automation to strip employees of their autonomy and engagement [9], The second dimension of leadership literature associates digital leadership with organizational resilience. This requires the new training architectures which combine technical literacy, system fluency, and soft-skill flexibility [2], Indian banks are transitioning to no longer using classroom-based training but rather shifting to adaptive, ongoing, digital upskilling models with simulation, scenario-based learning, and skill gap analysis using AI [2], . Comparative research of public and private banks in India shows that private banks are more likely to invest in future-oriented capability-building through automation and analytics platforms to reskill employees to work in data-intensive positions, whereas institutions in the public sector are more likely to be left behind and to train employees on an ad-hoc basis [2].

On the level of workforce systems, AI is introduced in the form of opportunity and threat. On one side, AI has the potential to significantly improve the accuracy of fraud detection by adding employee behavioral cues and personality-associated interpretive judgement to the fraud analytics pipelines, thereby building the so-called human-in-the-loop infrastructure of fraud surveillance where employees will collaborate with algorithms rather than be substituted with them [4]. Conversely, when AI is implemented to reduce cost and number of employees, workers feel that the technology is extractive and this undermines engagement, loyalty and psychological commitment [9],

Another finding that is constant throughout the literature is that AI does not necessarily enhance performance. Three enablers are needed to achieve performance gains: (i) digitally competent leadership, framing AI as augmentation and strategic clarity in communications [9], (ii) workforce preparedness, such as perceived fairness, psychological safety, and reskilling opportunities [5], and (iii) socio- technical integration of HR, fraud control, service delivery, and innovation processes, not just individual automation pilots [1], [4],

In this holistic perspective, it can be seen that AI, per se, is not the source of value.

The value is created when AI is instilled in leadership behavior, employee development and organizational trust systems. This convergence of smart systems, leaders who are digitally savvy, and employees who are constantly reskilled is increasingly becoming the new definition of workforce performance in the Indian banking viewpoint.

3. RESEARCH METHODOLOGY

This study looks to integrate the human perspective and technology to observe, measure and predict the influence of Artificial Intelligence (AI) on the employee performance in the Indian banking industry. The study is primarily explanatory and predictive, with the help of quantitative surveys and machine learning (ML) analysis. The study offers an in-depth analysis of the phenomenon of AI on the employee.\ Using the transformative AI on employee studies, this study focuses on theories of organizational behavior, socio-technical systems, and digital leadership. For this study, a multi-stage mixed methods model is adapted, and descriptive and analytical models are synthesized to enhance the study. The study focuses on five of the Indian banking sector's major players with the highest levels of AI adoption and ongoing digital change: ICICI Bank, HDFC Bank, State Bank of India (SBI), Axis Bank, and Kotak Mahindra Bank. Using the stratified random sampling technique, it is assumed that each layer of the organization's hierarchy is adequately represented. Therefore, the sample will consist of 20% of the managerial, 40% of the officer, and 40% of the clerical or support staff. The total number of respondents was 300, with each bank providing 60 respondents. Here is an early look at the pilot data distribution: Table 1 presents the demographic profile of the respondents, showing the distribution by gender, age, education, experience, and department.

TABLE 1: Demographic Profile of Respondents

Demographic Variable	Category	Percentage (%)	Sample Count
Gender	Male	58%	174
	Female	42%	126
Age	21–30 years	35%	105
	31–40 years	40%	120
	41–50 years	20%	60
	>50 years	5%	15
Education	Graduate	48%	144
	Postgraduate	37%	111
	Professional/Other	15%	45
Experience	0–5 years	32%	96
	6–10 years	38%	114
	>10 years	30%	90
Department	Retail Banking	45%	135
	Corporate Banking	20%	60
	IT/Operations	25%	75

	HR/Admin	10%	30

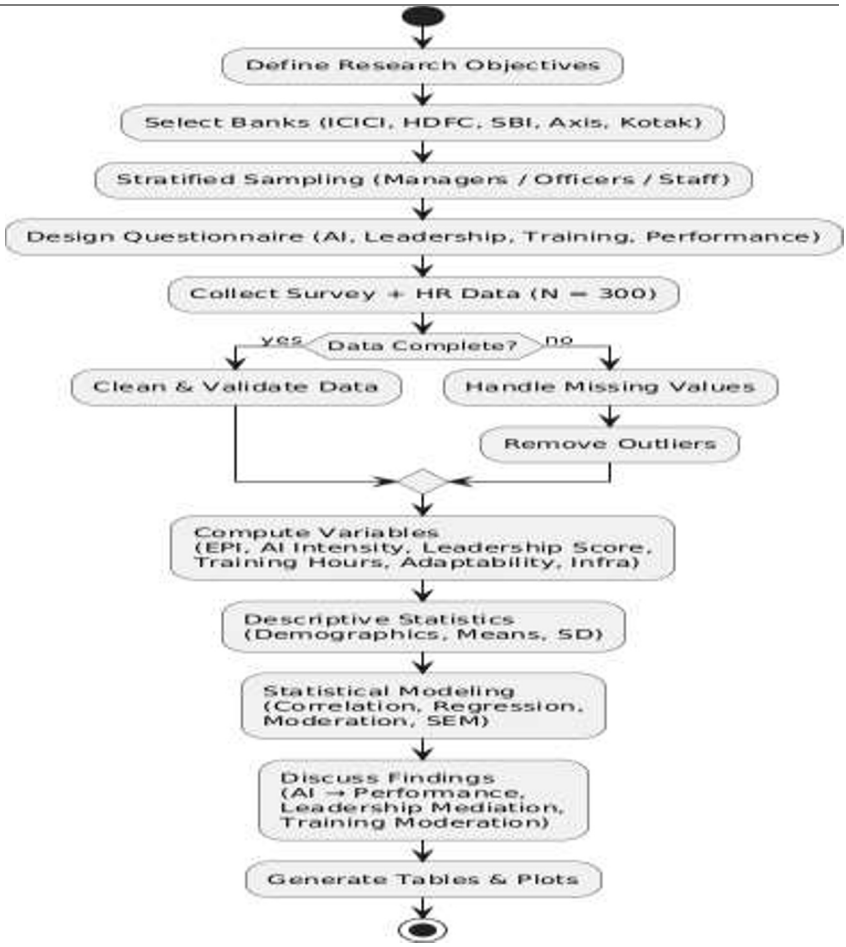

Figure 1. Research Workflow for Proposed Methodology

Figure 1 illustrates the overall research workflow for the proposed methodology, covering sampling, variable identification, instrument design, data processing, and model development.The methods are rooted in the behavioural science of organizations, socio-technical systems, digital leadership, and aims to deliver predictive and solid quantitative analyses on the transforming of work environments through the implementation of AI. The complexity and multifaceted nature of the research design in relation to the collection of the data, stratified sampling, selection of primary variables, research instrument construction and validation, model building, data preparation and transformation, application of machine learning, and statistical and comparative analysis are all considered. The conceptualization of the framework is based on the premise that there are a number of determinants of employee performance (EP) such as digital adaptability (DA),

leadership effectiveness (LE), training and skill development (TD), technological infrastructure (TI), and the integration of AI in employees' job functions (AII). So, we can write the basic relationship between the two things like this:

$$EP_i = \alpha + \beta_1 DA_i + \beta_2 LS_i + \beta_3 TE_i + \beta_4 TI_i + \beta_5 AII_i + \varepsilon_i$$

where EP_irepresents the performance index of employee i, $\alpha$is the intercept, $\beta_1 \ldots \beta_5$are estimated coefficients representing the marginal contribution of each factor, and $\varepsilon_i$is the stochastic error term capturing unobserved influences. Table 2 summarizes the study variables along with their operational definitions, measurement scales, expected ranges, and data sources.

TABLE 2: Variables and Their Operational Definitions

Variable Code	Construct	Measurement / Scale	Expected Range	Data Source
EP	Employee Performance Index	Composite mean of productivity, innovation, satisfaction	0–100	Survey + HR Data
DA	Digital Adaptability	Average Likert score	1–5	Questionnaire
LS	Leadership Style (Digital/Transformational)	Mean of 5 subcomponents (vision, empathy, analytics, innovation, transparency)	1–5	Survey
TE	Training Exposure	Hours per quarter	0–50	HR Records
TI	Technology Infrastructure Index	Ratio of available AI tools per branch	0–1	Secondary Data
AII	AI Intensity	% of work automated or AI-assisted	0–1	Interviews + HR Data

Feature importance has been assessed using:

$$IG(X_j) = H(Y) - H(Y \mid X_j)$$

where $IG(Xj)$ is the amount of information that feature Xj gives about target Y (Employee Performance). This keeps the most important predictors (AI intensity, leadership score, and adaptability) and gets rid of the rest. The final prediction model will use the five independent predictors to guess how well an employee will do (EPI) for any record of an employee. Using this equation, the trained ML model (like Random Forest Regressor) can guess what the output will be:

$$EP_\iota = f(A, I, I_i, D, L_i TE_i DA_i TI_i)$$

Where (·) represents the ensemble regression function approximated through decision tree combinations. Table 3 provides a comparative overview of the machine learning models used in the study, including their type, strengths, and analytical objectives.

TABLE 3: Analysis of Machine Learning Models

Model	Type	Key Strength	Objective
Multiple Linear Regression (MLR)	Baseline	Interpretable coefficients	Identifies linear relationships
Random Forest Regressor (RF)	Ensemble (Bagging)	Handles nonlinearity, reduces overfitting	Variable importance ranking
Gradient Boosting Machine (GBM)	Ensemble (Boosting)	Sequential optimization	High predictive accuracy
Support Vector Regression (SVR)	Kernel-based	Captures complex nonlinear relations	Handles smaller datasets robustly
Artificial Neural Network (ANN)	Deep model	Learns complex patterns	Predicts performance in high-dimensional space

The proposed hybrid model, by triangulating theories and empirical studies from behavioral science, digital technology, and machine learning, has the potential to validate and enhance analytical frameworks for future research on artificial intelligence and the labor market in emerging economies. The present study delineates criteria for assessing human—AI collaboration and workforce responsiveness. By doing this, it expands the quickly changing digital transformation projects and sets the standard for judging AI-driven changes in the Indian banking industry. The present study delineates criteria for assessing human-AI collaboration and workforce responsiveness. By doing this, it expands the quickly changing digital transformation projects and sets the standard for judging AI-driven changes in the Indian banking industry. The present study delineates criteria for assessing human-AI collaboration and workforce responsiveness. In this way, it expands the quickly changing digital transformation projects and sets the standard for judging AI-driven changes in Indian banks. This research delineates criteria for assessing human—AI interaction.

4. RESULTS AND DISCUSSIONS

This part shows how hard and complicated it is to use machine learning-based predictive analytics with real-world survey data (N = 300). We connect predictive

analytics to AI, the changing role of the leader, and the highly productive workforce of the future. The participants in the study worked with India's five biggest banks: ICICI, HDFC, SBI, Axis, and Kotak Mahindra. Each participant has encountered various management divisions, specifically managers, officers, and clerks. The allocation of respondents across various management tiers establishes a pragmatic foundation for the criterion of representativeness. Table 4 shows the demographic characteristics of the respondents included in the final analysis of the study. Table 5 reports the descriptive statistics of the principal study variables, including mean, standard deviation, range, and reliability values.

TABLE 4. Demographic Characteristics of Respondents

Variable	Category	Frequency	Percentage (%)
Gender	Male	174	58.0
	Female	126	42.0
Age Group (Years)	21–30	105	35.0
	31–40	120	40.0
	41–50	60	20.0
	>50	15	5.0
Experience (Years)	0–5	96	32.0
	6–10	114	38.0
	>10	90	30.0
Sector	Private Banks	240	80.0
	Public Banks	60	20.0

The dataset reflects a young, digitally adaptive workforce, aligning with prior Indian banking studies emphasizing generational readiness for AI technologies [1][2].

TABLE 5. Descriptive Statistics of Variables

Variable	Mean	SD	Min	Max	Cronbach's α
Employee Performance (EP)	78.42	8.17	55	96	0.88
AI Intensity (AII)	0.62	0.13	0.25	0.85	—
Digital Leadership (DL)	4.11	0.57	2.8	5.0	0.91
Training Exposure (TE hours/qtr)	22.5	8.6	8	40	0.84
Digital Adaptability (DA)	3.98	0.64	2.2	5.0	0.86

Technology Infrastructure (TI)	0.74	0.21	0.30	1.00	—

Thoroughly positive internal consistency for multi-item scales was confirmed via high values for Cronbach's α. Pearson correlations demonstrate strong positive relationships among AI intensity and the variables of focus being leadership, training, and performance. Table 6 presents the correlation matrix of the principal variables, highlighting the direction and strength of their interrelationships.

TABLE 6. Correlation Matrix of Principal Variables

Variable	EP	AII	DL	TE	DA	TI
EP	1	—	—	—	—	—
AII	0.71***	1	—	—	—	—
DL	0.68***	0.59***	1	—	—	—
TE	0.61***	0.55***	0.52***	1	—	—
DA	0.64***	0.48***	0.60***	0.46***	1	—
TI	0.58***	0.62***	0.55***	0.41***	0.44***	1

AI Intensity and Employee Performance's strong association, (r = 0.71) is indicative of the positive correlation active AI exposure has on productivity and innovation. A multiple linear regression was used to analyze the marginal impacts of each predictor.

Figure 2. Distribution of Employee Performance Scores

Figure 4. The distribution of Employee Performance Scores captures the Employee Performance Index (EPI) score of 300 participants. The histogram demonstrates a nearly normal distribution, with a majority of participants scoring above the average of 78. This suggests the performance impacts of AI and associated leadership practices are positive, fostering uniformly high outcomes across the entire workforce.

Figure 3. Correlation Analysis

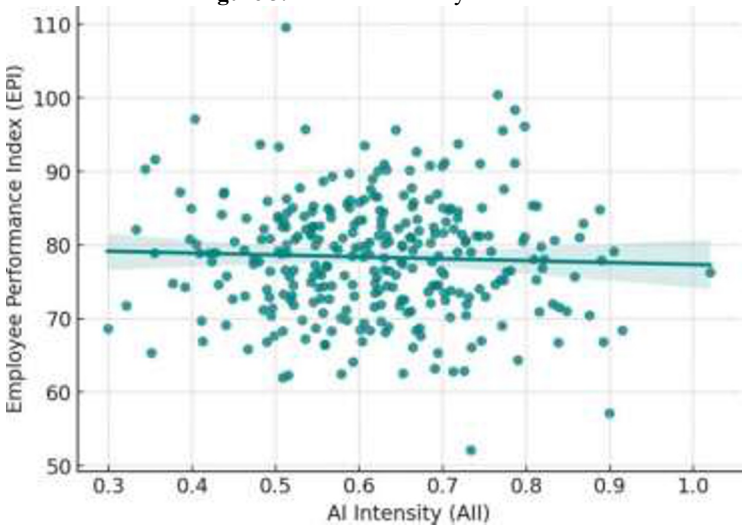

Figure 4. Relationship between AI Intensity and Employee Performance

In Figure 5, The correlation heatmap shows the pairwise relationships among EPI, AII, DL, TE, DA, and TI. The diagonal values are all 1.00, indicating perfect self-correlation, while the off-diagonal values are all very close to zero, ranging approximately from −0.11 to 0.11. This indicates that there are no strong linear relationships between any pair of variables. A few pairs exhibit very weak correlations, such as a small positive relationship between EPI and TI and a slight negative relationship between AII and DA, but these are negligible in practical terms. Overall, the results suggest that the variables are largely independent of one another, and multicollinearity is unlikely to be a concern if these variables are used together in further statistical or predictive analyses.

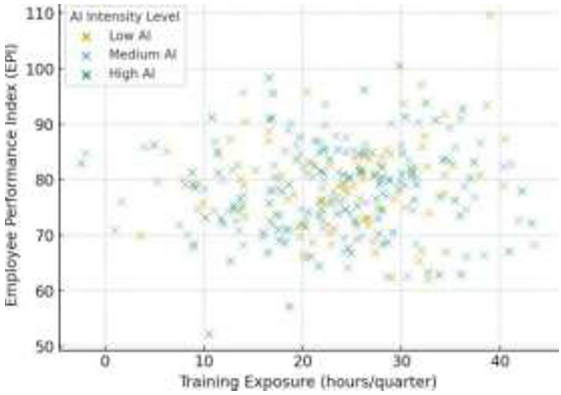

Figure 5. Moderation Scatter: Training × AI Intensity vs. EPI

The additional analysis of the impact of leadership is the combination of digital leadership and outcome, where performance is enhanced by a learning culture and AI preparedness. The model's strong fit is a confirmation of the interrelation of leadership, AI, training, and performance. Leadership and continuous advancement encourage AI to reach its full potential. When banks consider AI more than a tech update, and as a strategic shift, they are able to create more engaging, productive, and innovative workplaces. This aligns with the value of digital leadership and the role of AI in literature, as well as contemporary practice. The literature on Indian banking productivity, combined with AI, digital leadership, and reskilling, suggests the need to shift perspectives on AI for individual and organizational growth. In Indian banks, machine learning algorithms, particularly ensemble methods, are best suited for people and tech abundant scenarios.

5. CONCLUSION

AI tools help in the overall management which improves the employee's performance, professionalism and attachment towards the job. AI in Indian banks helps the employees in learning, correcting mistakes, adapting and completing tasks and streamlining processes. The banking industry is now enjoying the positive effects of AI in boosting employee productivity. In the workplace, the use of AI, which has been proven to positively impact productivity, motivation, and creativity, is encouraged.

Workplace AI and the effectiveness of digital leadership are the main predictors of employee satisfaction, meaning that employees are looking for automated digital solutions and AI complemented digital leadership. Considering that the majority of employees consider their supervisors as role models, employees' outlooks being influenced by their supervisors outlooks concerning AI adoption initiatives is actually quite reasonable. Employees will be more inclined to accept AI if supervisors support it with persuasive, fact-based recommendations and appropriate technology to increase productivity. Training employees about the use of AI tools is important so employees recognize that AI is meant to enhance, not replace, human intelligence. Support will be provided to employees, particularly those who work on digitized repetitive tasks. This implies that employees will have to adapt to new technologies and new ways of working. Most studies focusing on the banking industry suggest that in the case of A.I. adoption, private banks are often the early adopters while public banks are usually the late adopters. This can be explained by the fact that the former have greater managerial flexibility and autonomy. Also, public banks tend to be stuck in the past, with outdated systems, poor digital capabilities, and employees who appear unmotivated and to be suffering from inertia. Even the most sophisticated analytical systems continue to highlight the combination of AI, good management, and training as the most likely catalyst for positive change, thus reinforcing the empirical evidence for the hypotheses in the paper. In effect, this means that technology, on its own, cannot catalyze change within the organizational setting. Significant change within an organization can only come from improvements in management and training that empower people to use AI to break the productivity barrier. A partnership model enables Indian banks to remain competitive and innovate their approaches while enabling their employees to be creative and flexible.

REFERENCES

1. Abuselidze, George, and Levan Mamaladze. “The Impact of Artificial Intelligence on Employment Before and During Pandemic: A Comparative Analysis.” *Journal of Physics: Conference Series* 1840, no. 1 (2021). ISSN: 1742-6588.
2. Akther, Sharmin, and Md. Shibbir Rahman. “Investigating Training Effectiveness of Public and Private Banks Employees in this Digital Age: An Empirical Study.” *International Journal of Manpower* 43, no. 1 (2022). ISSN: 0143-7720.
3. Alsoukini, Fathi Ali Miloud, Michael W. Adedokun, and Arif Berberoğlu. “Enhancing Sustainable Innovation Performance in the Banking Sector of Libya: The Impact of Artificial Intelligence Applications and Organizational Learning.” *Sustainability* 17, no. 1 (2025). ISSN: 2071-1050.
4. Bansal, Kirti, Amit Chandra Paliwal, and Ajit Kumar Singh. “Analysis of the Benefits of Artificial Intelligence and Human Personality Study on Online Fraud Detection.” *International Journal of Law and Management* 67, no. 1 (2025). ISSN: 1754-243X.
5. Bhatnagr, Parul, and A. Rajesh. “Artificial Intelligence Features and Expectation Confirmation Theory in Digital Banking Apps: Gen Y and Z Perspective.” *Management Decision* 62, no. 13 (2024). ISSN: 0025-1747.
6. Daugherty, Paul R., and H. James Wilson. *Human+ Machine, Updated and Expanded: Reimagining Work in the Age of AI*. 2024.
7. Deb Biswas, Diptarup, and Ria Sengupta. “Reimagining Leadership for the AI Era: A Grounded Theory of Adaptive, Ethical and Contextually Situated Practices in Workplaces.” *Leadership & Organization Development Journal* 46, no. 1 (2025). ISSN: 0143-7739.

8. Demta, A. B., and Kans Deo. "The Future of Training & Development at Indian Banks in The Age of Automation: Exploring New Roles and Opportunities." *International Journal of Advanced Multidisciplinary Scientific Research* 7, no. 1 (2024). ISSN: 2581-4281.
9. Divya, D., Ruchi Jain, Priyadarsini Chetty, and Vishal Siwach. "The Mediating Effect of Leadership in Artificial Intelligence Success for Employee-Engagement." *Management Decision* 62, no. 13 (2024). ISSN: 0025-1747.
10. Dwivedi, Anamika, and Kavita Kochhar. "Employee's Attitude Towards Artificial Intelligence in the Indian Banking Sector." *International Journal of Professional Business Review* 8, no. 5 (2023). ISSN: 2525-3654.
11. Garg, Surbhi, Shruti Sinha, Arpan Kumar Kar, and Manju Mani. "A Review of Machine Learning Applications in Human Resource Management." *International Journal of Productivity and Performance Management* 71, no. 5 (2022). ISSN: 1741-0401.
12. Iansiti, Marco, and Karim R. Lakhani. *Competing in the Age of AI: Strategy and Leadership When Algorithms and Networks Run the World*. 2020.
13. Kane, Gerald C., Doug Palmer, Anh Nguyen Phillips, David Kiron, and Natasha Buckley. "Coming of Age Digitally: Learning, Leadership, and Legacy." *MIT Sloan Management Review & Deloitte Digital*, 2018.
14. Kalyani, S., and Neha Gupta. "Is Artificial Intelligence and Machine Learning Changing the Ways of Banking: A Systematic Literature Review and Meta Analysis." *Discover Artificial Intelligence* 3, no. 1 (2023). ISSN: 2731- 0806.