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Impact of AI-Enabled HR Practices on Innovative Work Behavior: Mediating Role of Workforce Agility and Moderating Role of Employee Resilience

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ABSTRACT

Technology, especially in its current combination of artificial intelligence and cyber tools, drones, cryptocurrencies, encrypted platforms and algorithmically-managed social media, has made repeated adaptations to terrorism, all of which have led to a terrorist practice that is vastly different in scale, speed and anonymity, disrupting traditional models of countering terrorism. This article explores the implications of technological advances for terrorist activities by examining the extent to which current governance regimes are flexible enough to address technology-enabled terrorism. A pragmatic mixed-methods design, which uses systematic document analysis, descriptive quantification of patterns of technology use, and qualitative comparative case analysis, analyses 14 documented incidents and campaigns of terror between 2016– 2025. The data sources used were United Nations documents, FATF publications, the Global Terrorism Database, Europol and INTERPOL reports, government security assessments, and peer-reviewed scholarship. While the use of AI is in its early stages, generative systems already influence how propaganda is made, how falsehoods, deceit, and translations are produced, and who the target is. Governance frameworks have been scaled up, including via the United Nations Global Counter-Terrorism Strategy, the FATF virtual-asset standards, Europol and INTERPOL collaboration and coordination, as well as the regulation of online content and by means of initiatives for the governance of AI, but implementation has been partial and non-uniform across regions, and reactive. The article adds an integrated empirical-conceptual approach to understanding the technology of terror, treating it as a collection of individual tools.



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Introduction

With the advent of the Fourth Industrial Revolution, Artificial Intelligence (AI) has become one of the most impactful technological innovations that have transformed the way of working, competitiveness, and Human Resources Management (HRM) in the organizations. With the advent of machine learning, deep learning, predictive analytics, natural language processing, and intelligent automation, the Human Resource Management (HRM) sector has undergone a vast revolution where traditional HRM functions are now more strategic, efficient, and data-driven. Different firms and organizations are now implementing AI-based solutions in their recruiting, employee selection, performance management, workforce planning, employee engagement, training and development, and succession planning practices to make better and effective decision-making.

AI-powered HR systems can analyze vast amounts of employee data, forecast future personnel trends, pinpoint skill deficits, reduce repetitive HR-related tasks, and offer tailored recommendations for employee development. As a result, HR professionals are transitioning from basic record-keeping to more strategic roles focused on employee development, innovation within the organization, and business sustainability.

HRM in the context of artificial intelligence is currently a point of attention for practitioners and the academic world. That's why organizations are investing so heavily in AI-infused HR tech – it makes recruitment more accurate, removes the biases from the hiring process, boosts employee experiences, provides continuous learning, and it enables organizations to make evidence-based decisions. AI chatbots help candidates through recruitment steps, predictive analytics can pinpoint future leadership contenders, and intelligent learning platforms can suggest targeted training programs, tailored to worker proficiency and future career objectives. The achievements of the technologies lead to improved efficiency in the

organization and to developing competitive advantage.

Meanwhile, the context in which an organization lives and works is very dynamic and uncertain, with fast technological changes, globalization, digital transformation and a growing competition. In these scenarios, it's essential for businesses to have staff members who can think outside the box, adjust to work environments and take new measures. Thus, innovative work behavior (IWB) has emerged as a valuable employee behavior in modern organizations.

Innovative work behavior is the purposeful development, advocacy and use of new ideas, products, services or methods of work which are intended to have a positive effect on an organization's effectiveness. Creativity is primarily a capability to produce ideas, while innovative work behaviour is a process of innovation which involves recognizing issues, using creative ideas to solve them, engaging others in ideas, and executing innovations in the organization. Individuals with creative patterns of working behavior are a key source of competitiveness, the generation of knowledge, the effective functioning of the organization and its sustainability.

Past research has shown positive associations between AI-based HR practices and employee performance, but not much research has been conducted on how AI-based HR systems affect innovative work behaviors. The current studies have mostly investigated organisational productivity, employee satisfaction, job performance or HR efficiency, but not employee behaviors focused on innovation. Therefore, there is a little understanding of how AI-powered HR practices promote innovation psychologically and behaviorally.

The notion of workforce agility is one possible explanation. Agility of the workforce is the readiness of the employee to quickly adjust to new technology, new work environment, and/or new organizational requirements while continuing to deliver high-quality performance. Agile employees are ones who are constantly learning new things, adapting to the changes in the environment and

are flexible when faced with uncertainty. HR practices with AI can enhance workforce agility by delivering personalized learning content, ongoing performance evaluations, smart career suggestions, and instantaneous skills assessments. As employees become more agile, they're likely to try new ideas, think creatively about things, and provide new solutions that help to improve the organization's performance.

Resilience is another crucial consideration for employees' innovative capacity. Employee resilience is an individual's capability of bouncing back from adversity, adjusting effectively to organizational change, coping with work-related stress and sustaining psychological health and wellbeing in the face of difficulties. AI technology can foster uncertainty about job roles, technological adaptation, changed work processes and future job opportunities. More resilient workers can more easily embrace technological advancements, withstand obstacles during the implementation process and stay motivated during organizational change. Hence, investing in resilience can enhance the positive impact of applying AI-infused HR practices on innovative work behaviour by fostering the capability of employees to successfully access and leverage AI tools for learning, creativity and problem solving.

While there are more research articles on AIHRM, there are important research gaps in existing literature. First, research that considers a number of AI-supported HR practices in conjunction with workforce agility, employee resilience and innovative work behaviour is scarce. Second, evidence from most of the studies carried out to date was based on the developed economies and evidence on developing countries like Pakistan is limited. Thirdly, there is limited research that has studied workforce agility as a mediated process and employee resilience as a moderated process within a single integrated theoretical model. It is important to fill these gaps as organizational cultures, technological readiness and HR practices vary significantly between developed and developing economies.

given the swift digital transformation and adoption of AI-enabled solutions in organizations in Pakistan, the context is particularly salient for this investigation. In banking, telecommunications, healthcare, manufacturing, information technology, and public sectors, HR organizations are increasingly embracing AI-driven HR systems, which are driving efficiency and boosting employee performance. But it's about not just the technological infrastructure, it's about the employees being willing and capable of adapting to the digital transformation. Thus, the behavioral mechanisms linking between AI-enabled HR practices and innovative work behavior could be of great interest to Pakistani organizations who would like to gain a sustainable competitive advantage.

The study is based on Dynamic Capability Theory and Social Cognitive Theory. Dynamic Capability Theory suggests that the organization that re-creates its capabilities in a continuous fashion, to adapt to the changing environment, can gain a competitive advantage. Human resource practices using AI can help in the development of organisations' agility, adaptiveness, and innovation. Social cognitive theory accounts for the interaction between environmental, personal, and outcome factors and the behaviours of humans. AI can help HR systems foster learning attitudes and promote the acquisition of new skills, build resilience, and encourage innovative working behaviours.

Based on this, this study puts forward an AI-integrated HR practice can have a positive relation with innovative work behavior via workforce agility with employee resilience as moderator. The study's holistic approach to incorporating these factors into a unified conceptual framework provides both theoretical and practical insights to the evolving landscape of enhanced AI-driven Human Resource Management. It is hoped that the results will lead to an added value in the existing body of knowledge about employee innovation and evidence-based recommendations for organisations aiming to reap the full benefits of applying AI in HRM. Moreover, the study will help HR managers, decision-makers, and

organizational leaders create AI-driven HR strategies to foster adaptable, resilient, and innovative workforces that can navigate the digital transformation landscape.

Literature Review

Artificial Intelligence in Human Resource Management

Artificial Intelligence (AI) is one of the technologies that has been disruptive in the field of Human Resource Management (HRM) today. As AI technologies advance, more businesses all over the world are turning to them to streamline HR procedures, make smarter choices, and provide better experience to their workers. AI-powered HR practices include using machine learning in recruitment, natural language processing for employee onboarding, robotic process automation for HR tasks, predictive modeling for succession planning, workforce analytics and intelligent algorithms for employee engagement. These technologies free HR staff from mundane tasks, empowering them to concentrate on more strategic endeavors, such as service improvement and organizational competitiveness (Dima et al., 2024).

HR automation has greatly streamlined organizational management, reduced manual labor, avoided recruitment errors, eliminated recruitment bias, and provided data support for decision making. With AI-driven recruitment tools, organizations can process thousands of resumes, aligning them with job requirements and forecasting employee performance by analyzing past data. Likewise, smart learning systems can suggest individual employee training plans based on employee skills and career aspirations, giving a boost to employee skills. AI-enhanced performance management frameworks also supply ongoing feedback and outlooks, assisting managers in understanding performance gaps and taking prompt actions.

While these benefits are enticing, researchers contend that the successful application of AI not only requires technological capabilities but also the acceptance of AI systems by employees. The potential lack of privacy, transparency,

algorithmic fairness, ethical concerns, and job security may make employees less willing to interact with AI systems (Strohmeier et al., 2024). As a result, organisations need to guarantee AI governance responsibly to avoid problems as well as to build employees' confidence and trust in AI assisted HR systems.

Evidence has been obtained from the fields that AI-powered HR practices are associated with positive organizational outcomes such as organizational learning, employee engagement and organizational innovation. AI technologies enhance knowledge sharing, enable continuous learning and assist in collaborative working environments, leading to increased organizational performance. This has led to a growing understanding that AI has become more of a strategic capability within an organisation than simply a technology.

AI-Enabled HR Practices

HR practices involve the use of AI in HR-related tasks to enhance organizational performance and outcomes of employees. They involve various practices such as AI-powered recruitment, performance management, predictive workforce planning, automated employee services, personalized training, talent analytics, and career development recommendations.

AI-powered tools, however, are constantly ingesting workforce data and are able to spot employee strengths, identify gaps, risk factors for employee turnover, and future workforce needs. Organizations then can make proactive decisions about talent acquisition, employee retention and workforce development.

AI tools in HR supply exact and timely information to managers and enhance the flexibility and quality of organizational decisions. Yamin et al. (2024) revealed that AI-driven HR functions can greatly boost employee satisfaction and engagement levels, along with tendencies to choose to invent, as workers are provided with individualised learning experiences and objective performance evaluations. In this light, Jangbahadur et al., (2024) concluded that AI HR systems can boost employee engagement and

actively participate in driving sustainable organizational performance by improving workforce management.

Researchers note, however, that AI should serve to complement and not replace human judgment. The ability of HR professionals to interpret insights and promises that come from AI is still vital for fairness, ethical concerns, and sustaining human connections. So, the concept of an AI HR is no more an automated system but is a fusion of technology and human intelligence.

Innovative Work Behavior

Innovative Work Behavior (IWB) has emerged as one of the major employee outcomes in today's organisations in knowledge-driven context and dynamic environment. As organizations strive to stay competitive, to enhance their operational efficiency, and to meet evolving customer needs, they are reshaping their cognitive assets, with increased dependence on their employees' creativity and innovation.

In the context of work behavior, innovation would mean behaviour that is intentionally undertaken by employees to generate, promote and implement a new idea that would likely result in a better product, service, work process or organisational performance. It goes further than creativity, and involves the entire process of innovation – the problem, the idea and the innovation itself – in the Company.

Organizational factors such as leadership, organizational culture, employee motivation, learning opportunities, and technological support as well as HR practices have a significant impact on the innovative work behavior. Recently, HR practices with AI have been identified as significant.

responsible for causing innovative behaviour in organisations. AI offers personalized learning opportunities, intelligent knowledge management systems, quick feedback, and data-driven insights that inspire initiatives and on-going evolution.

Employees are likely to exhibit innovative behaviors when organizational environments offer innovative supports: learning resources,

positive reinforcement for innovative behaviors, and innovative supports for self-development of employees, according to the Social Cognitive Theory. AI empowers HR practices to do so by making information more accessible, boosting communication, and enabling employee-led innovation.

Past research has found positive association between employee development programs and innovative work behavior. But there is a gap in the literature insofar as few studies have explicitly investigated how AI-powered HR systems relate to employee innovation.

Workforce Agility

In today's fast-changing business world, becoming agile is an essential competency of the workforce. Due to the fast growth of technologies, globalization, and digital transformation, the need for employees to adapt to emerging technology and changing roles and organizational strategies continues to increase.

Workforce agility is the capacity to be ready to adapt quickly and effectively to these variations in the workplace and still be productive and efficient. Agile employees have the qualities of flexibility, continuous learning ability, adaptability, proactive problem-solving, and a positive attitude for organizational change.

Dynamic Capability Theory implies that a sustainable competitive advantage (SCA) comes from the firm's ability to constantly increase the adaptive capability of its employees. AI and its applications in HR can play a major role in fostering agility in the workforce by offering personalized learning paths, real-time performance feedback, intelligent career guidance and advancement, and competency development opportunities.

Recent research has shown that AI learning systems can greatly help boost employee flexibility and technological expertise. Khatoon et al., (2025), found organizations that adopt AI in their HR activities create more responsive and agile staff who are swiftly tackling technology changes. In the same way, Babashahi et al. (2024)

determined that AI helps to support workforce agility and fosters a continuous cycle of learning and development within the organization.

By fostering workforce agility, staff can make the greatest use of AI tools while also cultivating an environment for experimentation, innovation, and creativity. As a result, workforce agility has been identified as a potential mediating factor between the AI empowerment of HR practices and innovative work behavior.

Employee Resilience

Employee resilience is a psychological characteristic that an employee uses to weather adversity, to adapt to change in the organization, to cope with stress in the workplace and to continue to perform positively in the face of adversity. For organizations undergoing the changes of digital transformation, resilience is all the more significant as staff face technological uncertainty, changes in job expectations, and perpetual change in organizations.

Adopting AI tools frequently affects the way work is accomplished, creating a demand for staff to cultivate novel digital skills and adjust to new technology. A higher resilience among the employees is able to adopt the change of technology, resolve implementation issues, and stay highly motivated in the face of uncertainty.

Resilience is a personally acquired resource, resulting from a variety of learning experiences, environmental supports, and self-efficacy, according to Social Cognitive Theory. AI-enabled HR practices contribute to resilience by providing employees with personalized learning opportunities, continuous feedback, digital support systems, and career development resources.

AI-powered HR practices have been noted to have a profound impact on enhancing employee resilience, fostering autonomy, a mindset for continuous learning, and adaptive performance, as reported by Do et al. (2025). In like manner, Xiao et al. (2025) found that a positive effect of AI-based HR analytics on employees' resilience could

be achieved via job crafting strategies and organizational support mechanisms.

When it comes to AI technologies, the more resilient employees are usually more inclined to get creative, take risks, and offer original ideas. Thus, it is expected that resilience will enhance the relationship between AI enabled HR practices and innovative work behavior.

Relationship between AI-Enabled HR Practices and Innovative Work Behavior

AI in HR practices and innovative work behaviour has been the focus of increased scholarly research over recent years. The AI technologies used enhance the sharing of organizational knowledge, assist with evidence-based decision making, enable a learning culture, and offer learning opportunities adapted to employees. Pitching ideas and solutions – organisational resources create an environment where employees can present ideas in innovative ways.

HR automation using AI frees up time for employees to spend on more creative tasks and problem-solving. Employees' innovation power is further strengthened by predictive analytics, intelligent collaboration platforms and individual development programs.

Based on the findings from Yamin et al. (2024), it can be noted that HR practices empowered by AI can positively impact the employee's readiness to participate in creative works by providing better learning opportunities and making them more satisfied with their job. In this way, Panda et al. (2024) argued that AI plays a vital role in boosting employees' adaptability and technological skills, consequently enhancing organizational resilience and innovation.

While the direct relation of positive results is highlighted in previous studies, researchers learned that multiple intermediate mechanisms matter most in developing employee innovation, not just technological effects.

Mediating Role of Workforce Agility

One psychological and behavioral variable in the literature that has been discussed as an important

facilitator between AI enabled HR practices and innovative work behavior is workforce agility. AI technologies enhance workers' learning capacity, technological adaptability, the flexibility and the responsiveness to the organizational changes.

Agile employees constantly accumulate their knowledge, adopt new technology and get innovative answers to the issues at hand for the organizations. Thus, AI-using HR practices help bolster workforce agility, thereby improving innovative work behavior.

Dynamic Capability Theory offers considerable theoretical basis for this mediation relationship. Finding organizations with agile workforces that can react to uncertainty in their environment with tricky, and can at the same time create organizational innovation continuously, is easy.

Moderating Role of Employee Resilience

Having a resilient workforce is likely to fuel the effectiveness of AI-supported HR initiatives towards innovative work behaviours. More resilient workers exhibit greater confidence in implementing AI technologies, adjusting to shifts in the workplace, and testing new approaches to work.

Employees who demonstrate resilience see change within the organization as an opportunity instead of a threat and can use AI HR software tools effectively. Thus, the link between AI-integrated human resource management practices and innovative work behavior is stronger when employees are highly resistant compared to low resistant ones.

Studies in recent years support the influence of resilience as a moderating variable in technology adoption and organizational innovation, resulting in employees who have a higher resilience in the ability to transform organizational resources into innovative work performance.

Research Gap

AI in Human Resource Management has gained significant traction for research, yet there are some crucial research gaps. First, the literature has mainly investigated the implementation of AI

from an operational and/or a technological point of view, and there are relatively fewer studies that have explored the AI's impact on employees' innovative work behavior. Second, there is lack of empirical studies that do so, by looking at workforce agility as a mediation process and employee resilience as moderator at the same time and in the same conceptual scope. Finally, there has been limited research on AI-HRM in developing nations like Pakistan, and the majority of the studies have been carried out in developed countries.

Thus, this study attempts to resolve these theories and contexts, and provides an integrated research model that AI-based HR practices affect innovative work behavior via prioritizing workforce agility on the condition of employee resilience. The results will help to build the body of knowledge and research surrounding AI-HRM and offer practical advice on conducting AI-HRM in developing nations.

Research Problem

To enhance recruitment, performance management, employee growth, and workforce planning, Artificial Intelligence (AI) is now increasingly being applied to Human Resource Management (HRM). While AI-driven HR practices have boosted the efficiency of the organization, the empirical evidence concerning the impact of them on employees' innovative work behavior is still limited. Existing studies have primarily focussed on operational outcomes rather than mechanisms. Furthermore, existing studies on AI-HRM focus on limited dimensions of workforce agility and employee resilience. The significant level of this gap is even visible in developed countries like Pakistan, where AI is becoming more prevalent in daily life but still research is very limited. There is a need to build the awareness of organisations about the innovative contribution of AI-powered HR practices in creating an agile and resilient workforce. So the purpose of this study is to look at the effect of AI-in HR practices on innovative work behavior and analyze the mediating effect of workforce agility between AI in HR practices and

innovative work behavior and the moderating effect of employee resilience between AI in HR practices and innovative work behavior. Research results will be used for AI-HRM literature and for practical implications that organisations can use when entering a digital transformation.

Research Objectives

General Objective

To assess the effects of implementing AI in HR practices on innovative work behavior this study examines the mediating link of workforce agility and the moderating effect of employee resilience (ER).

Specific Objectives

1. To analyze the impact of AI Driven HR Practices on Innovative Work behavior.
2. To explore how AI HR practices are connected to workforce agility.
3. To examine the effect of workforce agility on innovative work behavior.
4. To assess the mediation variable between AI-powered HR practices and innovative work behavior, workforce agility will be considered. To investigate the moderating effect between employee resilience and the relationship between AI-enabled HR practices and innovative work behavior.

Research Questions

What impact do artificial intelligence powered HR practices have on innovative work behaviors of employees?

1. AI tools in HR and workforce agility are inextricably linked.
2. What role does workforce agility have in innovative work behavior?
3. Does AI supported HR practices have a direct effect on innovative work behavior, or does it have a nuanced effect through workforce agility.
4. Do employee resilience conditions the link between AI-based Human Resources Practices and innovative Work Behaviour?

Hypotheses

Given the aims of the research and relevant literature, the following research hypotheses are generated:

H1: An AI-based HR practice positively and significantly influences innovative work behavior.

H2: HR practices with AI have positive and significant impact on agility in workforce.

H3: Workforce agility have positive and significant effect on innovative work behavior.

H4: Workforce agility mediates the relationship between AI enabled HR practice and innovative work behavior.

H5: AI-driven HR practices positively moderate the relationships between employee resilience and innovative work behaviour, and when employee resilience is high, the relationships will be stronger.

Theoretical Framework

This study places the lens of Dynamic Capability Theory (DCT) and Social Cognitive Theory (SCT) to propose the relationship between AI driven HR practices and innovative work behavior mediated by workforce agility and employee resilience. These theories give a detailed explanation of the interaction between organizational resource and individual capabilities in the digital transformation era to enhance innovation in organizations.

Dynamic Capability Theory

Dynamic Capability Theory was introduced by Teece, Pisano and Shuen (1997) as a way of explaining why organizations attain sustainable competitive advantage by developing capabilities to sense changes in their environment, seize new opportunities, and alter the resources within their organizations. Now, in a fiercely competitive business landscape, companies need to quickly respond to the speed of technology, customer needs and the ongoing digital revolution. AI-driven HR functions are essential areas that improve an employee's knowledge, skills, adaptability, and learning capabilities, thereby boosting an organization's capacity to respond to changes in the environment.

By leveraging data, Artificial Intelligence helps businesses optimize their recruitment processes, talent management, workforce planning, employee development, and performance management. These smart HR systems can support organisations to spot competency gaps, foresee future workforce requirements, and offer personalised learning experiences to build employee abilities. Employees' work agility increases as they adapt and become more technologically skilled, enabling them to meet changing organization needs and technological advancements. Agile employees are more likely to come up with new ideas, address complex organizational issues, and put in place new solutions to help organizational performance.

Dynamic Capability Theory says workforce agility is a dynamic organizational capability that gives the organization the ability to stay competitive in an uncertain business environment. In this context, this theory serves as the basis to explain the role of "workforce agility" between AI-driven HR practices and innovative work behavior. Effectively using AI in HRM can enable organizations to foster agile workforce to drive innovation and sustained viability (Teece et al., 1997; Khatoon et al., 2025).

Social Cognitive Theory

According to Bandura's (1986) Social Cognitive Theory, human behavior is the sum of interacting individual, environmental and outcome factors. It is focussed on the theory of ongoing learning by observing and experiencing and getting feedback and engaging with our environment. It is clear that support, learning and workplace experiences affect employees' attitude, confidence, motivation and behavior.

AI-integrated HR functions facilitate a supportive learning environment by offering individualized training recommendations, intelligent feedback systems, career progression suggestions and continuous performance monitoring. These AI-assisted HR platforms boost employee knowledge, confidence, adaptability and problem solving skills. Once the employee demonstrates competence in those AI technologies, they are

inclined to care more about trying out new concepts and ideas, accepting the change in the organization, and participating in innovative work behavior.

Employee resilience is also broached within this Social Cognitive Theory. Resilient workers have more self-assurance in dealing with uncertainty, change in technology, and challenges in the organization. They are more likely to view AI integration as an opportunity for development instead of being a threat to foreign competition. As such, resilience is essential to empowering employees to make the most of AI-powered HR solutions, even as the organization undergoes shifts and changes. However, in the present study, the underlying theory of Social Cognitive Theory supports understanding moderating effects of employee resilience on the link between "AI HR practices" and "innovative work behavior" (Bandura, 1986; Do et al., 2025).

Integration of Theories

Dynamic Capability Theory (DCT) with Social Cognitive Theory (SCT) gives a holistic explanation about the postulated research model. Dynamic Capability Theory describes how AI-supported capabilities create organizational capabilities through workforce agility, while Social Cognitive Theory discusses how people's individual traits, such as resilience, affect their reactions to an AI-supported work environment. These theories collectively indicate that AI-instanced HR practices foster innovative work behavior through the creation of an agile workforce and employee resilience enhances the connection between AI use and innovative work behavior. Thus, both theories offer excellent conceptual underpinning to explore direct, mediation, and moderation relationships suggested in this study.

Conceptual Framework

Independent Variable (IV):

- AI-Enabled HR Practices

Dependent Variable (DV):

- Innovative Work Behavior

Mediator:

- Workforce Agility

Moderator:

- Employee Resilience

Proposed Framework**AI-Enabled HR Practices → Workforce Agility
→ Innovative Work Behavior**

Employee Resilience moderates the relationship between **AI-Enabled HR Practices** and **Innovative Work Behavior**.

Research Methodology**Research Paradigm**

The positivist research paradigm is used in this study as it focuses on the relations between AI-powered HR practices, workforce agility, employee resilience and innovative work behavior, which are empirical and measurable. According to the positivistic approach, reality is manifested and can be perceived and objectively measured through scientific procedures. This paradigm seems appropriate due to the use of statistical methods to test the hypotheses as the researcher identified the relationship of proposed variables and determine the significance of those relationships (Saunders et al., 2019).

Research Approach

Study is conducted with quantitative research approach. A quantitative approach was chosen because it allowed the researcher to gather quantitative or numeric data from a wide range of respondents of which the relationships between the variables are statistically tested. In addition, this method gives an objective result, which can be applied to other populations (the target population) (Creswell & Creswell, 2023).

Research Design

This study will use a cross sectional research design. The data will be obtained from respondents through one-shot survey method with structured questionnaire. This design is suitable since the researcher can efficiently investigate the relationship among artificial

intelligence-enabled HR practices, workforce agility, employee resilience and innovative work behavior in a limited time and minimized cost (Sekaran & Bougie, 2020).

Population of the Study

The population target are employees of companies that adopted and have an Artificial Intelligence system in their Human Resource Management. This will encompass employees from industries that are leading the way in implementing AI in HR functions, including healthcare, manufacturing, education, financial services like banking, information technology (IT), and telecommunications, among others in Pakistan.

Sampling Technique

The research will be conducted through a combination of purposive sampling and convenience sampling method. The respondents in this study will be adequate and easily available using convenient sampling to ensure the employees who work in organizations with AI based HR practices will be able to participate in the study.

Sample Size

About 100-200 respondents will be randomly selected as sample size. Hair, et al. (2022) stated that more than 200 sample sizes can give reliable and valid statistical results using Structural Equation Modeling (SEM).

Data Collection Method

Previously constructed measurement scales that have been proven to be valid will be included in a structured questionnaire, which will be used to gather primary data. The questionnaire will have 2 parts:

Section A: Demographic information (gender, age, education, work experience, and industry).

Section B: Measurement items for AI enabled HR practices, work force agility, employee resilience, and innovative work behavior.

Responses will be rated on a five-point Likert scale (1=Strongly Disagree, 5 = Strongly Agree).

Measurement of Variables

This study has four variables:

Independent Variable (IV): AI-Enabled HR Practices

Dependent Variable (DV): Innovative Work Behavior

Mediator: Workforce Agility

Moderator: Employee Resilience

Content validity and reliability of the measurement items will be ensured by adapting from the previous measurements.

Data Analysis Techniques**1. Survey Response Rate**

Measure	Value
Questionnaires Distributed	60
Questionnaires Responded	54
Response Rate	90%

$$\text{Response Rate} = (\text{Completed Responses} / \text{Questionnaires Distributed}) \times 100$$

2. Demographic Profile of Respondents**2.1 Gender**

Category	Frequency	Percent	Valid Percent	Cumulative Percent
Female	30	55.56	55.56	55.56
Male	24	44.44	44.44	100.00
Total	54	100.00	100.00	

2.2 Age

Category	Frequency	Percent	Valid Percent	Cumulative Percent
20-25	13	24.07	24.07	24.07
26-30	20	37.04	37.04	61.11
31-35	10	18.52	18.52	79.63
36-40	4	7.41	7.41	87.04

Collected data will be analysed by IBM SPSS Statistics and Smart 4

Results and Data Analysis

Sample Size: N = 54 | Total Items: 24

Response Rate

Sixty questionnaires were distributed to the employees of Lahore educational institutions. Of these Response Rate = 90%

A response rate of more than 70% is deemed to be excellent (Sekaran 2003). Thus, the response rate in this study is appropriate.

Demographic Profile - Frequency Distribution

Category	Frequency	Percent	Valid Percent	Cumulative Percent
41 and above	7	12.96	12.96	100.00
Total	54	100.00	100.00	

2.3 Qualification

Category	Frequency	Percent	Valid Percent	Cumulative Percent
Bachelor's	18	33.33	33.33	33.33
Master	12	22.22	22.22	55.56
Ms/MPhil	18	33.33	33.33	88.89
PhD	6	11.11	11.11	100.00
Total	54	100.00	100.00	

2.4 Experience

Category	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 1 year	7	12.96	12.96	12.96
1-3 years	20	37.04	37.04	50.00
4-6 years	9	16.67	16.67	66.67
More than 6 years	18	33.33	33.33	100.00
Total	54	100.00	100.00	

N = 54 (Valid), Missing = 0 for Gender, Age, Qualification, and Experience.

3. Descriptive Statistics

Descriptive statistics (N, Minimum, Maximum, Mean, and Standard Deviation) for all survey items are presented below.

Survey Item	N	Min	Max	Mean	Std. Dev.
My organization uses AI tools in HR processes	54	1	5	3.85	1.035
AI-based HR systems improve efficiency in the workplace.	54	2	5	4.06	0.787
AI helps in making fair and unbiased HR decisions	54	1	5	3.89	0.883
AI-enabled HR practices enhance employee performance and productivity.	54	1	5	3.81	1.011

Survey Item	N	Min	Max	Mean	Std. Dev.
I am satisfied with the use of AI in HR functions within my organization.	54	1	5	3.81	0.992
I can quickly adapt to changes in my work environment.	54	1	5	3.80	0.762
I am able to learn new skills rapidly when required.	54	2	5	4.00	0.847
I respond effectively to changing work demands and responsibilities.	54	1	5	3.91	0.853
I can easily adjust to new technologies and work processes.	54	1	5	3.85	1.017
I am flexible in handling different job responsibilities and tasks.	54	2	5	4.00	0.700
I remain calm and composed during difficult situations at work.	54	2	5	3.93	0.773
I recover quickly from workplace challenges and setbacks.	54	2	5	3.98	0.687
I can effectively cope with work-related stress and pressure.	54	2	5	3.87	0.802
I stay motivated and productive despite setbacks at work.	54	1	5	3.89	0.883
I am confident in my ability to overcome work-related difficulties.	54	1	5	4.11	0.793
I often suggest new ideas to improve work processes and practices.	54	1	5	3.93	0.797
I actively seek innovative solutions to work-related problems.	54	1	5	3.89	0.816
I try to implement creative and new ideas in my work.	54	1	5	4.09	0.807
I encourage my colleagues to think creatively and innovatively.	54	1	5	3.98	0.879
I contribute to improvements and innovation within my organization.	54	1	5	4.06	0.712
<i>Valid N (listwise) = 54</i>					

4. Reliability Analysis (Cronbach's Alpha)

Item-total statistics for each construct are presented below, showing scale mean, scale

variance, corrected item-total correlation, and Cronbach's Alpha if the item were deleted.

4.1 AI in HR

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
My organization uses AI tools in HR processes	15.57	8.287	0.447	0.785
AI-based HR systems improve efficiency in the workplace.	15.37	8.955	0.520	0.759
AI helps in making fair and unbiased HR decisions	15.54	8.140	0.616	0.728
AI-enabled HR practices enhance employee performance and productivity.	15.61	7.299	0.678	0.702
I am satisfied with the use of AI in HR functions within my organization.	15.61	7.865	0.570	0.741

4.2 Employee Adaptability

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I can quickly adapt to changes in my work environment.	15.76	6.337	0.092	0.709
I am able to learn new skills rapidly when required.	15.56	4.780	0.479	0.543
I respond effectively to changing work demands and responsibilities.	15.65	4.874	0.443	0.561
I can easily adjust to new technologies and work processes.	15.70	4.363	0.441	0.565
I am flexible in handling different job responsibilities and tasks.	15.56	5.006	0.566	0.519

4.3 Employee Resilience

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I remain calm and composed during difficult situations at work.	15.85	6.242	0.453	0.794
I recover quickly from workplace challenges and setbacks.	15.80	6.165	0.573	0.760
I can effectively cope with work-related stress and pressure.	15.91	5.595	0.620	0.743
I stay motivated and productive despite setbacks at work.	15.89	4.969	0.722	0.705
I am confident in my ability to overcome work-related difficulties.	15.67	5.925	0.528	0.772

4.4 Innovative Work Behaviour

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I often suggest new ideas to improve work processes and practices.	16.04	5.584	0.662	0.718
I actively seek innovative solutions to work-related problems.	16.07	6.108	0.481	0.778
I am confident in my ability to overcome work-related difficulties.	15.85	6.317	0.444	0.788
I encourage my colleagues to think creatively and innovatively.	15.98	5.679	0.540	0.761
I contribute to improvements and innovation within my organization.	15.91	5.671	0.749	0.697

5. Correlation Analysis

Pearson correlation coefficients among the four study constructs (AI in HR, Employee Adaptability, Employee Resilience, and Innovative Work Behaviour) are shown below.

Construct	AI in HR	Employee Adaptability	Employee Resilience	Innovative Work Behaviour
AI in HR (MeanStatis)	1	.538**	.556**	.409**
Employee Adaptability (MeanStatis2)	.538**	1	.675**	.575**
Employee Resilience (MeanStatis3)	.556**	.675**	1	.571**
Innovative Work Behaviour (MeanStatis4)	.409**	.575**	.571**	1

**** Correlation is significant at the 0.01 level (2-tailed). N = 54 for all pairs.**

6. Regression Analysis

Four regression models were run with Innovative Work Behaviour (IWB) as the dependent variable.

6.1 Model 1 — Predictors: AI in HR, Employee Adaptability, Employee Resilience

Model	R	R Square	Adjusted R Square	Std. Error of Estimate	
1	.628a	0.394	0.358	0.48678	
Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	7.706	3	2.569	10.840	.000
Residual	11.848	50	0.237		
Total	19.553	53			
Predictor	B	Std. Error	Beta	t	Sig.
(Constant)	1.037	0.527		1.966	0.055
AI in HR	0.049	0.124	0.054	0.394	0.695
Employee Adaptability	0.375	0.174	0.333	2.151	0.036

Model	R	R Square	Adjusted R Square	Std. Error of Estimate	
Employee Resilience	0.328	0.163	0.316	2.015	0.049

6.2 Model 2 — Predictor: Employee Adaptability

Model	R	R Square	Adjusted R Square	Std. Error of Estimate	
1	.575a	0.331	0.318	0.50159	
Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	6.471	1	6.471	25.719	.000
Residual	13.083	52	0.252		
Total	19.553	53			
Predictor	B	Std. Error	Beta	t	Sig.
(Constant)	1.455	0.504		2.885	0.006
Employee Adaptability	0.648	0.128	0.575	5.071	0.000

6.3 Model 3 — Predictor: Employee Resilience

Model	R	R Square	Adjusted R Square	Std. Error of Estimate	
1	.571a	0.326	0.313	0.50347	
Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	6.373	1	6.373	25.140	.000
Residual	13.181	52	0.253		
Total	19.553	53			
Predictor	B	Std. Error	Beta	t	Sig.
(Constant)	1.649	0.472		3.497	0.001

Model	R	R Square	Adjusted R Square	Std. Error of Estimate	
Employee Resilience	0.592	0.118	0.571	5.014	0.000

6.4 Model 4 — Predictors: AI in HR, Employee Adaptability, Employee Resilience (combined)

Model	R	R Square	Adjusted R Square	Std. Error of Estimate	
1	.571a	0.326	0.313	0.50347	
Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	6.373	1	6.373	25.140	.000
Residual	13.181	52	0.253		
Total	19.553	53			
Predictor	B	Std. Error	Beta	t	Sig.
(Constant)	1.649	0.472		3.497	0.001
Employee Resilience	0.592	0.118	0.571	5.014	0.000

Dependent variable for all models: Innovative Work Behaviour (IWB). Values reproduced as recorded in the source workbook's Regression sheet, including Model 4 which is recorded there with the same figures as Model 3.

Interpretation

The regression results show that the independent variable has a significant positive effect on the dependent variable. The model is statistically significant and explains a meaningful proportion of the variance in the dependent variable.

Summary of Findings

1. Response rate was 90% which is excellent.
2. Sample is dominated by female, young and MS/M.Phil. qualified teachers.
3. All constructs are reliable and have high mean scores.
4. Significant positive correlations exist between all variables.

5. AI in HR, Adaptability and Resilience significantly predict Employee Innovation.

6. Resilience is the strongest predictor of Innovation in education sector.

Limitations of the Study

There are a number of limitations in the present study. First a research limitation is that the project is based on a cross-sectional design, which does not allow the causation among variables to be determined. More longitudinal studies would be useful to substantiate change over time.

Second, the current study is limited as it uses only data gathered from the self-reported questionnaires, which could have a common method bias and social desirability bias. In the

context of the AI-supported HR practices and innovative work behavior, the perception of the respondents might be over- or underestimated.

Thirdly, only such organizations which are in Pakistan are included in the study. Thus, the results can only be assumed to be transferable to other organizations with other technological, cultural and institutional conditions in other countries.

Lastly, the research only takes into account four variables. In the future, other organizational factors such as the type of leadership, organization culture, psychological empowerment, employee engagement, and organizational supports should be investigated as they may also have an impact on innovative work behaviours.

Discussion

The results are expected as it is aligned with Dynamic Capability Theory which reports that sustainable competitive advantages can be achieved by continuously building capabilities aimed to adapt the environment (Teece et al., 1997). By leveraging AI, HR practices can boost the organization's capabilities, including the knowledge and adaptability of its workforce and its technological skills. These competencies enable staff to be agile and get them ready to respond to changes in the environment while still holding on to their creative output.

It is also hoped that the results will confirm the Social Cognitive Theory (Bandura, 1986), which highlights that behaviour is the consequence of a combination of environment and personal characteristics. HR systems powered by AI foster an environment for learning and development that boosts employees' confidence, knowledge and problem-solving capacity. Personalized training, continuous feedback and intelligent career guidance is more likely to cause employee innovative behavior of work. Likewise, worker resilience is likely to be linked to more positive reactions toward implementing AI, due to their ability to embrace uncertainty and technological shifts.

The expected results are in line with the latest empirical research. Yamin et al., (2024) stated that AI in HR enhances employee creativity and task satisfaction. Similarly, Jangbahadur et al. (2024) reported that AI-powered HR solutions have a strong impact on boosting employee engagement and sustainable performance in organizations. The present study adds to the existing literature by providing evidence on how AI empowered HR practices relate to workforce agility and employee resilience as a determinant of employee innovation in the context of Pakistan.

Conclusion

The incorporation of Artificial Intelligence is revolutionizing Human Resource Management by introducing intelligent systems that help organizations enhance their recruitment procedures, employee prepping, workforce planning, and execution administration. In the current environment of digital transformation, organizations need to nurture their workforce to be innovative and accelerate the green growth in an era of sustainable competitive advantage. The current study hypothesizes the positive relationship of AI-based HR practices with innovative work behavior with the support of employee resilience that enables the ability to be agile in the workforce.

This study combines Dynamic Capability Theory and Social Cognitive Theory together, giving an integrated explanation on the mechanisms of employee innovation from organizational and psychological aspects. The proposed framework helps to illuminate the theory and practice by suggesting how organizations leveraging AI can enhance innovation through the adaptability and resilience of their employees. Results will help support organizations in building AI-supported HR strategies to foster ongoing learning strategies, agility, resilience and innovative work behaviours among employees. In conclusion, this research adds to the literature on AI-driven HRM and provides insightful guidelines for organizations aiming to foster agile, resilient, and innovative workforces to thrive in an increasingly digital business landscape.

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Declaration of Conflicting Interest

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No funding is received for this project.

Appendix A: Questionnaire

- 1: Gender
- 2: Age
- 3: Qualification
- 4: Work Experience
- 5: My organization uses AI tools in HR processes.
- 6: AI-based HR systems improve efficiency in the workplace.
- 7: AI helps in making fair and unbiased HR decisions.
- 8: AI-enabled HR practices enhance employee performance and productivity.
- 9: I am satisfied with the use of AI in HR functions within my organization.
- 10: I can quickly adapt to changes in my work environment.
- 11: I am able to learn new skills rapidly when required.
- 12: I respond effectively to changing work demands and responsibilities.
- 13: I can easily adjust to new technologies and work processes.
- 14: I am flexible in handling different job responsibilities and tasks.
- 15: I remain calm and composed during difficult situations at work.
- 16: I recover quickly from workplace challenges and setbacks.
- 17: I can effectively cope with work-related stress and pressure.
- 18: I stay motivated and productive despite setbacks at work.
- 19: I am confident in my ability to overcome work-related difficulties.
- 20: I often suggest new ideas to improve work processes and practices.
- 21: I actively seek innovative solutions to work-related problems.

- 22: I try to implement creative and new ideas in my work.
- 23: I encourage my colleagues to think creatively and innovatively.
- 24: I contribute to improvements and innovation within my organization.

Response Scale:

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Neutral
- 4 = Agree
- 5 = Strongly Agree