Journal of Emerging Markets and Management
https://journals.zycentre.com/jemm

ARTICLE

The Role of AI, IoT and Blockchain in Enabling Workplace Sustainability and Efficiency—An Empirical Analysis

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ABSTRACT

The rapid development of Artificial Intelligence (AI), the Internet of Things (IoT), and Blockchain has revolutionized organizational working practices, enabling digital transformation and sustainability. The current study investigates the drivers of the adoption of these technologies, analyzes their impact on the productivity of employees. There is evidence that AI-powered automation boosts efficiency through minimization of repetitive tasks, IoT optimizes the use of resources, and Blockchain brings transparency and security to business processes. AI-powered system resistance, lack of training in AI, and security risks in data collection, however, are impediments to adoption. The findings of factor analysis reveal four critical factors that shape the adoption of AI: efficiency, collaboration, automation, and work flexibility. The ANOVA findings show that attitudes toward AI-powered up skilling are not statistically influenced by AI-powered system resistance, which means other factors aside from those related to AI may have more importance. The study offers relevant insights for organizations functioning in emerging economies. This research contributes valuable knowledge to the convergence of technology adoption and sustainable digital transformation, providing strategic guidance to organizations on how to adopt AI, IoT, and Blockchain, while avoiding pitfalls in their adoption. The research highlights the significance of responsible integration of AI, employee participation, and ethical aspects to realize the full potential of these technologies in contemporary workplaces.

Keywords: Artificial Intelligence (AI); Internet of Things (IoT); Blockchain; Digital Transformation; Workforce Productivity; Sustainable Business; AI Adoption

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ARTICLE INFO
Received: 10 July 2025 | Revised: 25 August 2025 | Accepted: 2 September 2025 | Published Online: 11 September 2025
DOI: https://doi.org/10.63385/jemm.v1i2.159

CITATION
Sait, S.A., Vijesh, P.V., 2025. The Role of AI, IoT and Blockchain in Enabling Workplace Sustainability and Efficiency—An Empirical Analysis. Journal of Emerging Markets and Management. 1(2): 66–80. DOI: https://doi.org/10.63385/jemm.v1i2.159

1. Introduction

The digital era introduced three pivotal technologies: Artificial Intelligence (AI) and Blockchain, and Internet of Things (IoT) that combined transform business activities and resource optimization and lead industries to sustainability [1, 2]. These technologies constitute the bedrock of the Fourth Industrial Revolution, influencing the future of work via improved automation, data-informed decision-making, and decentralized systems.

These lead modern enterprise evolution in the same way past industrial revolutions did while controlling strategic decisions and operational efficiency and long-term business performance [3]. The operational streamlining occurs through AI automated systems which also improve predictive analytics functions while the IoT provides time-sensitive resource tracking and Blockchain technology establishes transparent monitoring across entire business networks [4]. These technological advances provide enterprises the capability to function more efficiently while ensuring security and sustainability which brings comprehensive impacts on the upcoming business environments [5]. Together, they empower organizations to function more intelligently, ethically, and efficiently in a digitally interconnected environment. Many factors, such as organizational dynamics, human behavior tendencies, and technical characteristics, determine how these technologies are applied in different circumstances [6]. Davis's 1989 Technology Acceptance Model (TAM), Venkatesh and colleagues' 2003 Unified Theory of Acceptance and Use of Technology (UTAUT), and Rogers' 2003 Diffusion of Innovation theory are examples of traditional theoretical models that offer helpful insights into this adoption process [7–9]. These well-established frameworks make clear how and why businesses embrace new technology in different ways and at different rates [10].

Enterprises experience fundamental business evolution because of quick research and development in Artificial Intelligence (AI), Internet of Things (IoT) and Blockchain technology [11–13]. The technologies function as core business requirements that organizations need to improve operational integrity alongside efficiency and environmental sustainability. The combination of AI features with processing optimization and data-driven optimization and IoT capabilities that deliver resource check and energy tracking and waste reduction capabilities [14–16]. The decentralized format of Blockchain provides companies secure verified transactions which are tamper-proof thus making it essential for supply chain management and corporate governance functions. Despite their potential, organizational opposition, cybersecurity threats, a lack of digital skills, and ethical concerns-especially in emerging markets-often impede implementation [17]. Current business success demands the essential unified implementation of these technologies among enterprises aiming to thrive in an interconnected sustainability-driven market [14, 18–20]. People increasingly examine how advancements in AI and IoT as well as Blockchain create changes in enterprise sustainability and workforce productivity during this period of digital acceleration. The paper discusses modern enterprises' implementation of these technologies along with their organizational efficiency effects and sustainability outcomes [21]. The research evaluates the productivity benefits AI automation delivers to workers and demonstrates how IoT promotes efficient waste reduction and sustainable energy consumption as well as demonstrates Blockchain-enabled trust and security for sustainable supply chains [22–26]. The investigation sheds light on the digital transformation obstacles which stem from cyber security problems and the hurdles of integrating ethical AI practices as well as workforce transition into technology-based working conditions [22, 25, 27–30]. The main objective of this paper analyzes the role that AI, IoT and Blockchain play in helping enterprises build sustainable digital ecosystems. Professionals can dedicate their attention to innovative strategic work because AI reduces repetitive tasks and IoT generates real-time operational data and Blockchain establishes ethical secure control systems [2, 31]. The analysis evaluates both the possible dangers which involve excessive dependence on automation together with ethical challenges in AI choices and complicated Blockchain integration into organizational structures. The research conducts a full analysis of digital transformation factors to develop a complete understanding of how digital transformation creates sustainable technology-driven companies [6, 32].

This study explores the critical interconnections that equip organizations with valuable insights for navigating the intersection of technological advancement, sustainability, and workforce transformation. It underscores the importance of understanding both the opportunities and constraints associated with integrating AI, IoT, and blockchain technologies to build a resilient and sustainable tech-driven infrastructure.

This study focuses on a thriving economy where people are skilled in digital technology. Its goal is to offer practical, tailored insights that align with well-known frameworks for technology adoption.

2. Review of Literature

The Internet of Things, artificial intelligence, machine learning, and big data are just a few of the cutting-edge technologies that are being integrated into manufacturing processes as part of the "Industry 4.0" revolution [33]. Blockchain enhances workplace sustainability through decentralized decision-making, real-time information sharing, and transparent supply chains, enabling resource efficiency, traceability, trust-building, and integration of circular economy principles for improved environmental and operational outcomes [34]. Industry 5.0 fosters workplace sustainability by integrating advanced technologies and stakeholder engagement to build digital value chains and smart cities [35]. Integrating IoT with Building Automation Systems (BAS) significantly enhances energy efficiency, occupant comfort, and CO_2 reduction through real-time monitoring and intelligent automation, while addressing key challenges such as interoperability, scalability, and cybersecurity in sustainable, clever building design [36]. AI's integration into SMBs enhances productivity and innovation through data-driven systems, though disparities in adoption rates persist across sectors. Inclusive policies and a data-centric culture are essential to ensure equitable and sustainable digital transformation [37]. The convergence of AI, blockchain, and big data within IoT ecosystems fosters real-time data processing, security, and system optimisation across domains [38]. Despite deployment challenges, these technologies significantly enhance operational efficiency, sustainability, and innovation in cyber–physical environments [39]. Integrating AI-driven waste management, EMS, and digital engagement platforms fosters operational efficiency and environmental performance in hospitality, though adoption is impeded by cost, institutional inertia, and regulatory barriers, necessitating strategic, theory-driven implementation approaches studied AI implementation for SMEs by analyzing the digitalization benefits of AI with Blockchain and IoT technologies [11]. This research confirmed that automated operations through AI lead to two primary benefits: improved workflow optimization and automated manual work processes along with immediate decision capabilities. Gen Z employees demonstrate quick AI technology adoption because of their native digital experience so their work productivity and involvement increase in the workplace. AI implementations enable the simplification of teamwork because its decision-making systems alongside automation tools minimize mistakes and improve organizational communication. Different AI capabilities enable the organization of resources as well as energy optimization and improved system performance [3]. Employed Gen Z staff members benefit from structured data-driven workplaces because this system enhances work productivity along with satisfaction rates. Modern technological tools based on artificial intelligence create new methods for Gen Z employees to work with digital assistants and collaborative platforms to obtain streamlined workflows supported by adaptive task management processes. studied how digital transformation affects workplace efficiency as well as sustainability levels [40]. The research established that AI-based machine learning tools enable predictive evaluation to help organizations enhance their operational choices through increased performance achievements. The research study finds support for the developing trend of AI tools which empower workers to develop creative solutions and problem-solving approaches and boost interterm collaboration. The predictive analytics capabilities of AI enable workforce members to identify forthcoming trends so they can correctly determine solutions and prevent future business issues. Digital transformation through AI enhances business operations efficiency as well as waste reduction for sustainability goals [41]. Through AI-driven solutions companies gain higher accountability in workplace processes which provides Gen Z workers accessible insights that help them work more efficiently while feeling more attached to their duties. Organizations harness the analytical strength of AI to review big databases and identify operational constraints which helps them develop focused solutions that boost staff efficiency together with work satisfaction levels.

There is frequently little theoretical depth in comprehending technology adoption patterns, especially among workers who have grown up in a digital environment, despite the fact that many studies concentrate on certain industries. Using proven models that describe how people and organizations react to new technology is necessary to close this gap. These include the Unified Theory of Acceptance and Use of Technology (UTAUT), which builds on the Technology Acceptance Model (TAM), which identifies perceived utility and ease of use as important adoption factors, and the Unified Theory of Acceptance and Use of Technology (UTAUT), which adds elements like social influence, effort expectancy, and facilitating conditions as significant influences. Rogers Diffusion of Innovation (DOI) theory emphasizes how innovation characteristics — such as relative advantage, compatibility, and observability — shape the adoption and dissemination of technology within social systems [42, 43]. These frameworks offer deeper insights into the mechanisms driving technology integration, particularly among Generation Z in emerging economies, who are pioneering the use of groundbreaking technologies like blockchain, artificial intelligence, and the Internet of Things (IoT) in professional environments [44, 45].

Through this study, the researchers seek to explore how emerging technologies AI, IoT, and Blockchain contribute to sustainable and efficient workplace environments. The literature review reveals that AI enhances automation and decision-making, IoT optimises resource usage through real-time monitoring, and Blockchain ensures transparency and trust. Together, these technologies enable streamlined workflows, reduced operational waste, and improved employee productivity, especially among digitally adept Generation Z workers. However, studies highlight significant challenges, including system resistance, lack of digital skills, ethical concerns, and cybersecurity risks. These insights indicate the need for strategic implementation, inclusive upskilling, and responsible digital policies. The review provides a strong foundation for this empirical investigation, which aims to identify key adoption drivers, assess productivity impacts, and analyse organisational barriers, ultimately contributing to the discourse on sustainable digital transformation in contemporary workplaces.

3. Theoretical Framework

The Technology Acceptance Model and the Unified Theory of Technology Acceptance and Use of Technology (UTAUT), two well-known technology acceptance models, have been thoroughly examined by this research team. After that, it examines the most recent research on how older people are utilizing mobile wallets. Three research topics are presented at the end, drawing from the body of existing literature, technological acceptability models, and a proposed framework.

3.1. Technology Acceptance Models

Various frameworks are examined in this study based on their applicability. In order to comprehend and examine how people behave when faced with innovations, numerous behavioral intention models and behavioral choice theories have been created. Studies in social psychology have inspired the majority of these models and theories.

The researcher believes that perceived behavior resulting from technological acceptability is what leads to the adoption of a mobile wallet. Consequently, models created to account for consumers' adoption of novel technologies are examined. These models are often useful in understanding the adoption of technologies. One such model is the well-known technology acceptance model (TAM), which has spawned a large number of research examining consumers' usage intentions and actual usage. On the theoretical front, an abundance of research studies has reported a strong and significant causal relationship between user beliefs and behavioral intention of technology adoption [46, 47].

3.2. Technology Acceptance Mode

TAM is a TRA adaptation created especially to describe how people utilize computers. It makes use of TRA as the theoretical foundation to determine the relationship between two major tenets: the utility and ease of use of computers, AI and the attitudes, desires, and behaviors of users. Since it solely examines computer usage, it is less comprehensive than TRA, but since it is grounded in more than a decade of information science study, it may work well for simulating human technology use [48].

The study will examine how effectively TRA and TAM predict and explain human computer behavior as well as AI. It will assess their ability to predict future behavior based on basic acts performed following a brief introduction to a system. After interacting with a prototype system or pre-purchasing the system, this is the kind of action that users do [49]. For analyzing how people use technology, the most widely used paradigm is the technology acceptance model. Though Bagozzi and Warshaw performed it even better, Davis introduced it first. Reasoned action is the foundation of the Theory of Applied Therapeutic Modelling (TAM), which was first put forth by Fishbein in 1975 and expanded upon by Ajzen in 1980. The various hypotheses and research papers that have been examined have a lot in common [50–52]. Perceived utility and ease of use are recognized as important and unique constructs that influence decision-making when it comes to employing information technology from a number of angles. They appear to play a considerable influence, even if they are not the only variables that may be used to explain user behavior (additional variables can be seen in the work of Cheney and colleagues (1986), Davis (1989), and Swanson (1988) [53–55].

Improved metrics are required to better understand the nature of perceived utility and per-echelon ease of use and their relative roles in computer use. The perceived utility and usability of the technology influence how it is actually used in the TAM. The perceived usefulness is the user's perception of how the use of the new technology can increase the user's efficiency. The main benefit of modern technology over earlier models is its ease of usage [56–58]. The system's ease of use refers to how simple it is to operate. The perceived usefulness of the system may rise with its simplicity of use. Adoption of current technology is influenced by how useful and simple it is seen to be. People's positive or negative feelings regarding an action are known as their attitudes. People evaluate performance and effort subjectively, which is known as perceived usefulness. It is significant to highlight that beliefs are not viewed as a stand-in for objective realities in this study; rather, they are meaningful variables that function as behavioral determinants [59]. The self-efficacy of a technology and the instrumentality of the technology have a dual impact on attitude. The TAM model is depicted in **Figure 1**.

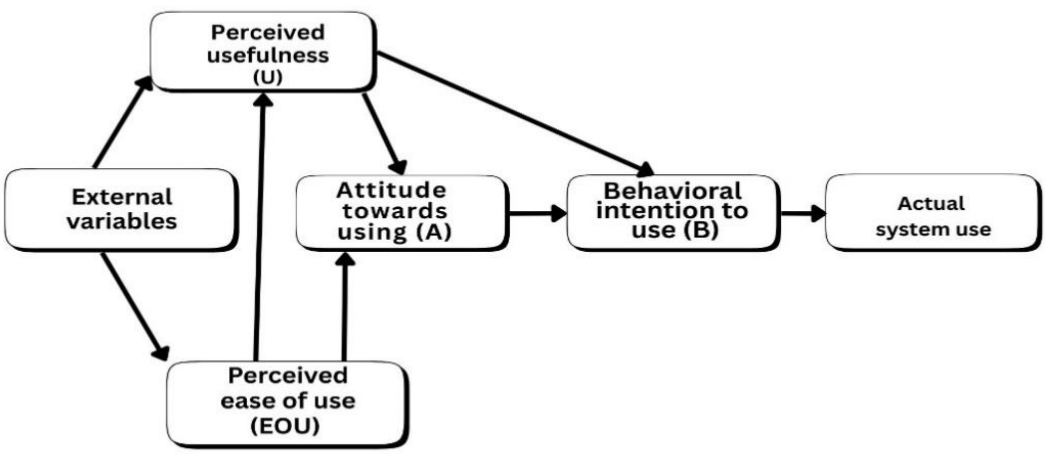

Figure 1. Technology acceptance model (TAM) based on Davis, Bagozzi, and Warshaw (1989).

3.3. Unified Theory of Acceptance and Use of Technology

The TAM is one of the most used and accepted models. As the result, researchers started to extend TAM with more factors that can affect the use of a technology. One outcome of these extensions is unified theory of acceptance and use of technology (UTAUT) developed by Venkatesh, Morris, and Davis. A theory called the Utility Acceptance Test (UTAUT) makes an effort to explain how users' intentions to utilize a technology and the behavior that results from its adoption (**Figure 2**). According to UTAUT, the conditions that make technology easier to use, the user's effort and performance expectations, and the technology's social influence all affect how a user behaves [60, 61].

Numerous shortcomings in the Market Access Technology (MAT) framework are being rectified as identified by the UTAUT. These include failing to take into account alternative technologies and solutions, assuming that adopting a technology is enough to use it in the real world, and failing to evaluate the technology's social impact. The most recent TAM framework upgrades, TAM2 and TAM3, aim to rectify some of the earlier flaws [10]. These revisions address these issues.

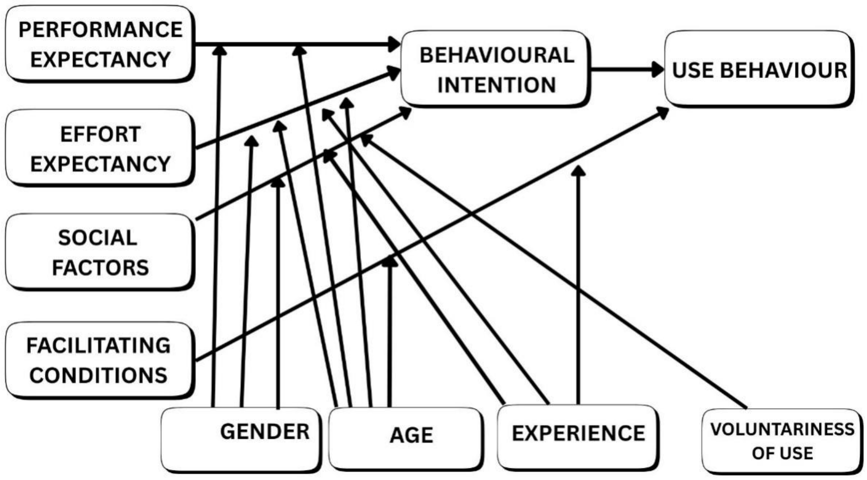

Figure 2. The UTAUT model based on Venkatesh and his colleagues (2003).

4. Objectives

- To identify the key factors influencing the adoption of Artificial Intelligence (AI), Internet of Things (IoT), and Blockchain technologies in promoting workplace digital sustainability.
- To assess user perceptions regarding the impact of AI-driven workflow automation, IoT integration, and Blockchain applications on organizational productivity and decision-making.
- To examine the challenges encountered by users in integrating AI, IoT, and Blockchain into sustainable business operations.

5. Significance of the Study

This study offers a thorough examination of how emerging technologies are transforming Generation Z workers in digitally sustainable workplaces. It focuses on how AI affects their overall engagement, team commitment, flexibility, and individual performance [40]. Understanding how the youngest generation of workers interacts with AI systems is crucial for maximizing workplace productivity and accomplishing long-term sustainable development goals, as digital sustainability becomes a more significant objective for enterprises [62, 63].

By examining Gen Z employees' behavioral and cognitive reactions to AI-enabled tools and platforms, the study highlights the strategic importance of AI in accelerating digital sustainability transitions [64–66]. Through investigating how they interact with intelligent systems like virtual collaboration platforms, AI-driven decision-making assistance, and workflow automation tools, the study seeks to clarify how these technologies can support increased productivity, better communication, and more efficient operations within sustainable business models [66–68].

The thorough analysis of AI adoption elements, such as technological preparedness, user awareness, perceived utility, faith in AI, and organizational support systems, is a fundamental part of the study [69–71]. These elements are examined in light of their effects on the efficiency and moral incorporation of AI into routine business operations. The study also looks into how AI may be used responsibly to minimize disturbance and maximize organizational and environmental benefits [72].

Business executives, technology strategists, and human resource specialists who are entrusted with creating AI-based projects that spur innovation without sacrificing environmental objectives or employee well-being will find the study's conclusions especially insightful [72–74]. The study offers recommendations for developing AI deployment techniques that support more resilient and environmentally friendly organizational cultures by increasing worker productivity and aligning with eco-friendly operational procedures.

Additionally, by promoting a balance between innovation and accountability, the study makes a substantial contribution to the scholarly conversation on the ethical use of AI. It presents conceptual frameworks for integrating AI that highlight the significance of fairness, transparency, and digital wellness [75, 76]. These frameworks encourage inclusive and human-centered digital transformation while assisting firms in avoiding problems like workplace alienation, over-automation, and digital fatigue[77].

In the end, the study adds to the body of research on AI-driven organizational change by providing solid empirical evidence of how AI affects Gen Z's experiences at work. It establishes the framework for further academic investigation into the changing interplay among worker dynamics, AI technologies, and sustainable business practices. The findings affirm that, in the digital era, the strategic and thoughtful integration of AI has the potential to drive innovation, enhance employee empowerment, and promote environmental sustainability.

6. Methodology

This research utilizes a quantitative research design to present a multidimensional and holistic view of the impact of emerging digital technologies-namely Artificial Intelligence (AI), Blockchain, and the Internet of Things (IoT)-on workplace productivity and catalyzing sustainable digital transformation within organizational contexts. The population of interest includes Generation Z employees working in different sectors within Hyderabad, India, who are a digitally literate workforce increasingly central to the success of modern-day enterprises.

6.1. Sampling Design and Data Collection

The study uses a non-probability purposive sampling method, targeting digitally literate Generation Z employees working in Hyderabad-based public and private sector organizations. The sampling frame consists of Gen Z employees aged between 1997 and 2012 employed in Hyderabad-based public and private sector organizations. Participants were recruited for the study via electronic outreach, and the data were collected using a structured online questionnaire, created and distributed through Google Forms. A total of 101 responses were collected and included in the final analysis.The questionnaire was developed from a thorough review of the literature and tested by expert review and pilot testing to ascertain clarity, reliability, and content validity. The tool had three separate sections.

6.1.1. Demographic Profile

Collecting ordinal and categorical variables like age, gender, educational level, type of industry, and experience in years.

6.1.2. Technology Familiarity and Utilization

With ratio-scale items in order to quantitatively measure the level of familiarity and usage of AI, Blockchain, and IoT technologies within the workplace.

6.1.3. Perceptions and Implementation Trends

Including Likert scale items (five-point scale from "Strongly Disagree" to "Strongly Agree") and multiple-choice questions with the goal of measuring employee attitudes, usage frequency, perceived effect on collaboration, productivity, and role in sustainable workplace practices.

6.2. Data Analysis Procedures

Quantitative data gathered were analyzed in a systematic manner utilizing Microsoft Excel for preliminary data cleaning and coding and then more in-depth statistical analysis done in IBM SPSS (Statistical Package for the Social Sciences). Descriptive statistics (frequencies, percentages, means, and standard deviations) were used, along with inferential tools such as factor analysis, one-sample t-tests, and ANOVA to determine relationships and patterns between demographic characteristics and the extent of technology adoption.

6.3. Rationale and Methodological Strengths

The choice of a completely quantitative technique is consistent with the research aims, which are to detect measurable patterns, correlations, and trends in technology adoption. The use of quantitative analysis makes it possible to draw statistically sound conclusions regarding how Gen Z workers use digital tools at work, how these interactions affect output, and how they help achieve sustainability objectives.

A pertinent framework for researching digital transformation in actual corporate settings is provided by concentrating on Hyderabad, a significant urban and technical center in India. Because they are naturally tech-savvy, Generation Z is a perfect demographic to gauge the adoption and efficacy of AI, Blockchain, and IoT in contemporary organizational structures.

The emphasis on Hyderabad-a technologically vibrant urban hub-offers a rich context for studying digital uptake in actual organizational settings. Additionally, Generation Z, which is best defined as "digital natives," represents a key demographic whose reactions to emerging technologies hold prognostic value regarding future workplace behavior.

The chosen methodology thus allows for a thorough, fact-based exploration of the ways AI, Blockchain, and IoT are restructuring organizational dynamics and promoting sustainable digital enterprise models.

7. Data Analysis

The study identifies AI, IoT, and blockchain as key drivers of digital transformation and workplace sustainability, encouraging security, efficiency, and flexibility. Factor analysis confirmed key drivers of AI adoption, including decision-making, automation, workplace flexibility, and collaboration, and referencing the potential of AI to automate work and enhance productivity. One-sample t-tests confirmed employees are inclined to be favorable towards perceiving AI in a positive manner, particularly in the context of enhanced decision-making and efficiency, while there are still some concerns about over-reliance on automation and ethics.

The final analysis included 101 responses that were gathered from Generation Z employees working in Hyderabad, India. A non-probability purposive sampling technique was used to get the sample.

In spite of concerns like the risk of data security breaches, the risk of job displacement, and the absence of AI training, ANOVA results indicated no significant effect on workers' perceptions of AI upskilling, implying that company AI training programs overcome these issues. Furthermore, IoT's potential for resource optimization and blockchain's potential for enhanced transparency and security were recognized, albeit their deployment being marred by regulatory and integration issues. The results emphasize the importance of strategic AI education, ethical regulation, and flexible workforce policies to enable responsible and sustainable digital transformation.

7.1. Objective I: To Examine the Factors Influencing the Adoption of AI, IoT, and Blockchain in Workplace Digital Sustainability

The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy is 0.651, indicating that the dataset is moderately suitable for factor analysis, though a higher value above 0.70 would be preferable for stronger results as presented in **Table 1**. This suggests that there is a reasonable level of shared variance among the variables, allowing for meaningful factor extraction. Additionally, Bartlett's Test of Sphericity yields a Chi-square value of 247.368 with 45 degrees of freedom (df) and a significance level (p-value) < 0.001, confirming that the correlation matrix is statistically significant. The factor analysis was conducted using principal component analysis (pca) and varimax rotation. The components with eigenvalues greater than 1 were retained and items with lower factor loadings than 0.40 or with high cross-loadings were dropped. The obtained factors had a distinct structure and reliability, and all the factors were retained with cronbach's alpha values of above 0.70.This means that the variables are sufficiently correlated to justify factor analysis. Since Bartlett's test confirms significant correlations and the KMO value is within an acceptable range, proceeding with Principal Component Analysis (PCA) is recommended to identify the key factors influencing AI, IoT, and Blockchain adoption in workplace settings. However, the moderate KMO score suggests that the dataset could be improved for stronger factor structures.

Table 1. KMO test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.651
Bartlett's Test of Sphericity	
Approx. Chi-Square	247.368
df	45
Sig.	<0.001

Source: Primary Data.

Table 2 shows that four key components with eigenvalues above 1 account for 70.02% of the total variance, indicating that the main factors influencing AI, IoT, and Blockchain adoption can be grouped into these four components. The Rotated Sums of Squared Loadings suggest a more balanced distribution, making interpretation clearer. The next step is to examine the Rotated Component Matrix to identify which specific factors contribute to these components. Yet, responses pertaining to blockchain were less robust than those pertaining to AI and IOT. This implies that even though respondents value blockchain's openness and traceability, they are still in the early stages of implementing technology in modern work environments. Future studies may use instruments that are balanced for each technology to guarantee direct comparability.

Table 3 shows how AI-related factors group into four components. The first component is linked to efficiency, with strong loadings for decision-making (0.765) and error reduction (0.743). The second focuses on collaboration, with AI improving teamwork (0.706) and boosting creativity (0.561). The third relates to automation and skill dependency, with AI overuse weakening manual skills (0.544). The fourth highlights workplace flexibility and skill enhancement, with AI encouraging up skilling (0.574). Further analysis using the Rotated Component Matrix can refine these groupings.

Table 2. Total variance explained.

Component	Initial Eigenvalues – Total	% of Variance	Cumulative %	Extraction Sums of Squared Loadings – Total	% of Variance	Cumulative %	Rotation Sums of Squared Loadings – Total	% of Variance	Cumulative %
1	3.226	32.259	32.259	3.226	32.259	32.259	2.915	29.147	29.147
2	1.412	14.118	46.378	1.412	14.118	46.378	1.443	14.425	43.572
3	1.276	12.765	59.142	1.276	12.765	59.142	1.403	14.029	57.601
4	1.088	10.878	70.021	1.088	10.878	70.021	1.242	12.420	70.021
5	0.758	7.579	77.600						
6	0.605	6.051	83.652						
7	0.519	5.192	88.844						
8	0.478	4.785	93.629						
9	0.406	4.060	97.688						
10	0.231	2.312	100.000						

Source: Primary Data.
Note: Extraction Method: Principal Component Analysis.

Table 3. Rotated component matrix for perceptions of ai impact on workplace functi.

Statement	Component 1	Component 2	Component 3	Component 4
AI saves time	0.606	0.010	0.133	−0.251
AI aids decision-making	0.765	0.041	−0.188	−0.161
AI reduces errors	0.743	−0.146	−0.168	−0.019
AI boosts creativity	0.206	0.561	0.687	0.001
AI improves teamwork	0.397	0.706	−0.035	0.372
AI encourages upskilling	0.472	0.065	−0.487	0.574
AI overuse weakens manual skills	0.062	−0.344	0.544	0.664
AI enhances workplace flexibility	0.616	0.304	0.123	−0.284
AI increases data-driven decision-making	0.789	−0.305	−0.054	0.057
AI automates repetitive tasks	0.542	−0.517	0.414	−0.074

Source: Primary Data.
Note: 4 components extracted. Extraction Method: Principal Component Analysis.

The study identifies four key factors influencing the adoption of AI, IoT, and Blockchain: efficiency and decision-making, collaboration and creativity, automation and skill adaptation, and workplace flexibility and up skilling. Factor analysis (PCA) confirmed that AI improves productivity, decision-making, and error reduction, while IoT optimizes resource management and Blockchain enhances transparency and security. The Total Variance Explained table indicated that these factors significantly contribute to AI adoption, while the Component Matrix showed strong associations between AI-driven efficiency, collaboration, and up skilling. However, challenges such as skill gaps, security concerns, and system integration issues remain key barriers.

7.2. Objective II: To Analyze How Users Perceive the Impact of AI-Driven Workflow Automation, IoT Integration, and Blockchain Applications on Productivity and Decision-Making

According to the findings, participants strongly and statistically significantly agreed ($p < 0.001$) that artificial intelligence (AI) has the potential to revolutionize the workplace. The consensus that AI will radically alter job positions over the next ten years is especially robust (M = 4.337), highlighting the general anticipation of substantial structural changes in the employment landscape. In a similar vein, respondents strongly agreed that AI plays a crucial part in their daily lives (M = 4.129), emphasizing how it is increasingly being incorporated into ordinary tasks and decision-making. Public understanding of the ethical and societal hazards associated with unrestrained technological growth is further highlighted by the perceived need for rigorous regulation of AI (M = 4.050).

Additionally, participants showed a high degree of confidence in AI-generated material (M = 3.901) and AI-driven recommendations (M = 3.980), demonstrating faith in AI's ability to produce dependable and innovative results. Additionally, there was optimism about AI's ability to facilitate or improve moral decision-making (M = 3.861), indicating a conviction in AI's value as a morally sound tool in challenging circumstances (**Table 4**).

Table 4. One-sample t-test results on employee perceptions of AI in the workplace.

Perceptions of AI in the Workplace	t	df	One-Sided *p*	Two-Sided *p*	Mean Difference	95% CI Lower	95% CI Upper
AI will change job roles in the next decade	54.244	100	<0.001	<0.001	4.337	4.18	4.50
AI should have decision-making authority	29.607	99	<0.001	<0.001	3.390	3.16	3.62
AI is essential in daily life	54.802	100	<0.001	<0.001	4.129	3.98	4.28
AI-driven recommendations are trustworthy	50.817	100	<0.001	<0.001	3.980	3.82	4.14
AI-generated content is creative	51.036	100	<0.001	<0.001	3.901	3.75	4.05
AI can improve ethical decision-making	50.074	100	<0.001	<0.001	3.861	3.71	4.01
AI development needs strict regulation	46.453	100	<0.001	<0.001	4.050	3.88	4.22
AI will lead to human-like robots	33.657	100	<0.001	<0.001	3.584	3.37	3.80
AI-powered managers are acceptable	32.056	100	<0.001	<0.001	3.307	3.10	3.51
AI should have legal rights	27.411	99	<0.001	<0.001	3.330	3.09	3.57

Source: Primary Data.

7.3. Objective III: To Investigate the Challenges Users Face When Integrating AI, IoT, and Blockchain into Sustainable Business Operations

a. Dependent Variable: Factors Influencing AI Usage [AI encourages upskilling]

b. Predictors: (Constant), Challenges in AI Usage [Fear of job loss, Data security concerns, Limited AI support, Lack of AI training]

The ANOVA results in **Table 5** indicate that challenges in AI usage-such as fear of job loss, data security concerns, limited AI support, and lack of AI training-do not significantly influence the perception that AI encourages up skilling (F = 0.976, $p = 0.424$). The high p-value (0.424) suggests that there is no statistically significant relationship between these challenges and employees' views on AI-driven up skilling. Additionally, the low regression sum of squares (2.418) compared to the residual sum of squares (58.822) indicates that the model explains very little variation in the dependent variable. Additionally, to check for variations in responses based on industry sectors, an analysis of variance (ANOVA) was performed. It was suggested that respondents from different sectors had similar perceptions because the result (F = 0.976, $p = 0.424$) was not statistically significant. Despite being non-significant, this finding nevertheless helps because it shows that Gen Z workers accept technology on a broad basis. Future research could explore multivariate regression for deeper insights, as the effect size was small.

Table 5. ANOVA – factors influencing AI usage.

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	2.418	4	0.605	0.976	0.424
Residual	58.822	95	0.619		
Total	61.240	99			

Source: Primary Data.

The study identifies lack of AI training, limited AI support, data security concerns, fear of job loss, AI compatibility issues, and resistance to AI as major barriers to AI adoption. Regression analysis highlights training gaps and security risks as the most significant concerns, yet ANOVA results show that these challenges do not significantly impact perceptions of AI-driven up skilling, suggesting that company training programs help mitigate resistance. While IoT and Blockchain adoption face regulatory and integration challenges, their potential for efficiency and security is widely recognized. The findings emphasize the importance of AI education, security policies, and adaptable workforce strategies for successful digital transformation.

According to the study's data, Gen Z workers support the use of AI and IoT in businesses. They believe that these technologies are essential for improving decision-making, workflow simplicity, and organizational communication.

8. Discussions

The findings of the present study provide theoretical support for the revolutionary effects of blockchain, artificial intelligence (AI), and the internet of things (IoT) on fostering operational efficacy and workplace sustainability among Hyderabad's Generation Z workforce. Four common constructs that significantly impact the acceptance and perception of AI-based technologies in organizational settings were validated by factor analysis results: efficiency and decision-making, collaboration and creativity, automation and skill adaptation, and flexibility and upskilling at work. The idea that AI improves task accuracy and managerial judgment is supported by the high factor loadings for decision-making, error reduction, and time-saving. These loadings also complement previous research that highlights AI's ability to decrease operational redundancy and expedite decision-making procedures. Similarly, the results confirm that AI capabilities are closely linked to creativity and collaboration, particularly when it comes to enhancing teamwork and encouraging creative thinking. These results show that AI benefits Gen Z workers not just in terms of operational assistance but also in terms of cognitive and social enhancement. The research reveals that ai technologies significantly enhance the output in the workplace by enabling automation, predictive decision-making, and cross-team collaboration. IOT enables real-time data collection and tracking, therefore enhancing process efficiency and energy management. While this study revealed a less heightened impact of blockchain, its ability to improve data security, transparency, and trust in organizational processes remains an essential area for future studies.

The study also highlights the intricate relationship between technologically driven automation and labor development. While AI simplifies routine tasks, it also raises concerns about a decline in physical skill and an excessive reliance on automated systems. It seems that companies can successfully offset employee concerns with forward-looking training and support strategies, even though there was no significant correlation (based on ANOVA results) between self-reported concerns, such as job anxiety, data security, or inadequate AI training-and upskilling intentions. IoT and blockchain perceptions show that their strategic significance in maximizing resources, security, and transparency is acknowledged. Respondents clarified, however, that interoperability problems and regulatory ambiguity restrict the practical application of these technologies. This emphasizes how crucial interoperability standards, regulatory frameworks, and organizational readiness are to successful implementation. The findings also support well-established theories of technology adoption, such as the unified theory of acceptance and use of technology (utaut2) and the Technology Acceptance Model (TAM). For instance, the central components in these models are aligned with the strong contributions of perceived ease of use (AI and IOT tools) and performance expectation (workplace productivity). This implies that when users find digital tools to be user-friendly and relevant to their work, organizational decisions to use them will be successful. By empirically investigating how AI, IoT, and blockchain interact with human actors and institutional frameworks, influencing not only tasks but also workplace culture and policy, this study contributes to the theory of socio-technical systems. In-depth qualitative or case-study evaluations of blockchain's effects on sustainability and governance, generational comparisons, and longitudinal studies to monitor adoption over time could all be part of future research.

Overall, the findings confirm that Gen Z employees view digital transformation driven by AI, IoT, and blockchain favorably if it is accompanied by robust training, moral protection, and a welcoming work environment. By offering a worker-focused lens through which digital technologies might be fairly and ethically integrated into organizational processes, this study contributes to the growing body of research on sustainable technology integration.

9. Limitations of the Study

Despite the meaningful contributions of this research, there are certain limitations of the study.

- Wider generalizability is constrained by the study's exclusive focus on Gen Z workers in Hyderabad.
- It disregards the perspectives of other worker generational groups.
- There was no qualitative depth and only quantitative methods were employed.
- Social desirability bias and self-reporting may influence responses.
- The combined examination of blockchain, IoT, and AI may ignore issues unique to each technology.
- Adoption of technology was only examined at the user level. There was no consideration of organizational strategies.

10. Conclusions

The combination between AI technology with Blockchain systems and IoT components produces major workforce enhancements alongside improved team communication and better decision-making abilities for Gen Z workers within sustainable organizations. The combination of technologies results in optimized workflows and decreases errors and maximizes resource management thus positively advancing sustainability goals. Organizations gain better effectiveness by merging AI automation with Blockchain features and IoT real-time data capability which results in improved efficiency combined with security and transparency capabilities. Organizations must address three primary difficulties regarding technical adjustments and ethical issues and digital exhaustion to establish sustainable digital environments. The research shows that using responsible technologies which combine AI and Blockchain with IoT components yields maximum results while controlling safety risks. For successful implementation of modern technologies organizations should create training programs and ethical codes and employee engagement plans.

The study demonstrates that organizations must unite their digital transformation efforts to sustainable business methods. The addition of human values in technological work environments enables enterprise creation of employee-powered sustainable workplaces which maintain long-term organization success and prepare for future developments.

Author Contributions

S.A.S. led the conceptualization, methodology, formal analysis, investigation, original draft preparation, and visualization. S.A.S. and P.V.V. jointly contributed to software development, validation, and manuscript editing. P.V.V. was responsible for data curation, provision of resources, supervision, and project administration. Both authors have read and approved the final manuscript.

Funding

This work received no external funding.

Institutional Review Board Statement

Ethical review and approval were waived for this study because it involved an anonymous questionnaire survey with minimal risk to participants.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study. The study confirms that all participants voluntarily agreed to take part in the anonymous survey.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request. Due to privacy and ethical restrictions, the raw survey data are not publicly available.

Conflicts of Interest

The authors declare no conflict of interest.

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