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Impact of Digital Literacy and Cultural Factors on Online Training for Workforce Productivity among Frontline Workers in India

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ABSTRACT

The study explores the role of digital literacy and cultural factors in shaping the effectiveness of online training among frontline healthcare workers in India. With the rapid digitization of workforce development initiatives, understanding how these two variables influence training outcomes is vital. A quantitative research design was employed, and data were collected from 603 healthcare professionals, including nurses, paramedics, doctors, and community-level workers such as ASHAs, ANMs, and Anganwadi workers. The study used Structural Equation Modeling (SEM) to examine the relationships among digital literacy, cultural factors, online training effectiveness, and workforce productivity. The findings reveal that both digital literacy and cultural compatibility significantly influence the uptake and success of online training programs, which in turn impact employee Productivity. The insights underline the importance of designing culturally sensitive and digitally inclusive training modules for India's diverse healthcare workforce.

Keywords: Frontline Workers, Digital Literacy, Culture, Productivity, Online Training
JEL Classification: J24, O33, I25, M53

1. INTRODUCTION

The growth of digital industry operations worldwide has reshaped workforce training methods because of expanding online learning platforms. Organizations that want to boost workforce productivity through frontline workers now implement digital technologies essential to their human resource development plans. The deployment of online training is a tool for workplace skills development because it will result in productivity gains and output enhancements (Banton, 2019). The use of online training initiatives reached a broad scale, but their effectiveness remains inconsistent, mainly due to frontline worker outcomes in developing economies such as India. Online training programs present specific challenges to frontline workers in the manufacturing, healthcare, retail, and agricultural sectors because they deal with unique obstacles in their engagement process (Bashingwa et al., 2021).

The vast socio-economic diversity of India creates an ideal condition for investigating digital literacy and cultural dimensions that affect online training outcomes. The 1.4 billion people in India exist within diverse social groups who demonstrate unique approaches toward digital platform use and efficiency levels (Nedungadi et al., 2018). The public awareness about digital literacy skills that enable a proper and critical digital environment has increased notably during the last few years. The successful implementation of online training by frontline workers depends heavily on their digital literacy levels within this particular scenario (Reddy et al., 2023). Workers who display superior digital literacy skills as frontliners gain better value from training sessions, leading to improved job performance. Workers with limited digital skills face obstacles when interacting with training programs, leading to reduced productivity and diminished skill development potential (Mohammadyari and Singh, 2015).

The importance of digital literacy stands out, but cultural elements, including language, social patterns, educational histories, and technological faith, need dedicated consideration. Different cultural elements in India substantially affect how frontline employees work with digital tools and participate in online training systems. Language barriers prevent frontline workers in India from accessing training materials due to their limited proficiency in English, as English dominates most online courses (Gupta and Pathak, 2018). How online training programs are received, and work depends on learning habits, educational methods, and cultural perspectives toward technological tools. Various elements create differences in worker interest and prevent equal access to online training opportunities.

Online training programs show excellent potential as workforce efficiency enhancers when developers create programs specifically targeted toward intended workers' digital skills and cultural backgrounds. Creating culturally appropriate digital training systems combined with inclusivity features leads to better success rates because frontline workers will have convenient access to learning content and the ability to interact meaningfully (Trenerry et al., 2021). To deliver optimal results, online training programs for India's workforce must adapt their delivery methods to address workers' capabilities in digital technologies and cultural sensitivities.

The research investigates how digital literacy, and cultural elements affect the effectiveness of online training for frontline workers across India. It systematically analyses how multiple variables shape training results by evaluating their impact on personnel's work output. The paper evaluates the relationship between digital literacy and cultural elements like language education and social norms, which impact the success potential of online training initiatives.

2. LITERATURE REVIEW

2.1. Cultural Factors and Online Training

Culture determines how individuals perceive learning and adopt technology through their behavioural tendencies. According to Hofstede's cultural dimensions theory, certain components, including power distance, uncertainty avoidance, and individualism versus collectivism, determine what people do in online training (Hofstede, 2011). People with high-power distance learning tendencies tend to prefer instructor-led education rather than participating in self-managed online courses. Cultures exhibiting high uncertainty avoidance demonstrate reluctance toward online training because their members doubt the legitimacy of digital resources (Olaniran et al, 2010). The learning preferences, together with the motivation and engagement levels of students within e-learning spaces, are influenced by cultural values (Lee et al., 2012). The effective design of online training solutions dedicated to multi-ethnic workforces depends on a complete understanding of cultural operational principles. online training techniques must consider the possible clash between organizational cultures and national cultures, where regional traditions may contradict the customer-centered values that are vital to hospitality environments (Rodriguez and Williams, 2010). In collectivistic societies, where group harmony and interdependence are highly valued, people's attitudes toward distance learning are different from those in individualistic cultures, where personal autonomy and self-reliance are prioritized (Anakwe et al., 1999).

H_1: Cultural factors significantly impact Online Training

2.2. Digital Literacy and Online Training

Research shows that digital literacy, represented by access and usage skills for digital tools, is a primary factor for the successful adoption of online training. The research shows that digital literacy affects e-learning program adoption rates because users with enhanced skills become more involved with digital learning systems (Yaseen et al., 2025). The components of technical skills, alongside information evaluation and communication abilities, form digital literacy that enables effective virtual learning (Aslan, 2021). Participation in online training faces challenges because of the digital divide, mainly in rural areas and underserved regions where low digital literacy levels prevent people from using digital training systems (Liu et al., 2020). A specific training program aimed at digital skills development helps e-learning initiatives become more effective in reducing educational disparities. Digital literacy is a necessity in the modern era, and it entails the reliable, critical, safe, and efficient use of digital technology in every facet of life (Dzobelova, 2020). It is more than just familiarity with technological tools (Campanozzi et al., 2023). It entails having the capacity to use technology to solve problems, assess information critically, and interact successfully in digital environments (Nahdi et al., 2022). The ability to access information from multiple sources, use digital tools to manage data, and create and distribute digital media are all components of digital literacy (Chethana and Noronha, 2023). Trainers must possess fundamental and analytical abilities to handle the data obtained from the Internet to foster learning, which is especially important in language education (Zhang, 2023).

H_2: Digital Literacy significantly impacts Online Training.

2.3. Online Training and Productivity

The recognition of online training emerged because it helps employees improve their work productivity through adaptable learning experiences. Online training programs that are properly designed lead to better employee knowledge retention, skill development, and job performance (Chethana and Noronha, 2023). Online training delivers advantages above traditional training approaches because it gives learners dynamic features of individual learning pace while offering real-time feedback through personalized learning sequences that boost efficiency and productivity (Shahiduzzaman, 2025) Online training effectiveness for productivity enhancement relies on the design quality of courses alongside active learner participation and proper institutional backing. Research demonstrates how blended learning techniques, combining virtual instruction with live classroom activities, lead to better work efficiency than exclusive virtual training (Cannaos et al., 2024).

Blended learning, combining traditional teaching methods' benefits with online educational resources access, allows more students to learn, as face-to-face hybrid educational models have shown more favorable effects on students' academic performance compared to traditional and online education (Sucianti et al., 2023).

Online blended learning allows employees to actively participate in a learning program conducted from any region of the world without leaving their workstation or residence (Hidayatullah and Larasati, 2019).

H_3: Online Training significantly impacts Productivity.

3. RESEARCH METHODOLOGY

3.1. Participants

The research participants were frontline healthcare workers from various occupations, including nurses, paramedics, doctors, Auxiliary Nurse Midwives (ANM), Accredited Social Health Activists (ASHA), and Anganwadi Workers (AWW). The participants were recruited from a variety of regions across India, representing both urban and rural areas to capture a wide spectrum of experiences and challenges related to digital literacy and cultural factors in online training. The selection of participants was based on the diversity of healthcare occupations to ensure comprehensive coverage of the healthcare sector. The study aims to achieve a balanced gender representation, with male and female participants equally represented to account for potential gender-specific variations in responses. Participants' ages range from 21 to above 50 years, representing healthcare professionals at different stages of their careers, from early-career workers to those with decades of experience. In terms of academic qualifications, participants were recruited from diverse educational backgrounds, including individuals with intermediate, graduate, and post-graduate qualifications, ensuring a variety of digital literacy levels. The study also considers the number of years of experience in the healthcare sector, with participants spanning those with 0–10 years, 10–20 years, and 20–30 years of professional experience. This diverse participant pool will provide a holistic understanding of how digital literacy and cultural factors influence the effectiveness of online training and workforce productivity among healthcare workers in India.

3.2. Procedure

The study will adopt a quantitative approach, relying on a survey as the primary data collection method. The survey instrument will feature Likert-type scales, following the framework established by Churchill (1979). Each survey item will be rated on a 5-point Likert scale, with the corresponding options: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

3.3. Questionnaire Development

For the development of the questionnaire, constructs were adapted from existing literature on digital literacy, cultural factors, and workforce productivity, specifically in the context of online training. The questionnaire was structured into two main sections, each addressing different dimensions of the research.

The first section collected demographic information from the participants. It included questions related to their age, gender, city of residence, educational background, and occupation. This section aimed to establish the participants' profiles and to ensure a clear understanding of the sample's characteristics.

The second section focused on digital literacy, cultural factors, and their impact on online training and workforce productivity. This section explored participants' familiarity with digital tools and online training platforms, their comfort with engaging in online learning environments, and their self-reported digital skills. Additionally, it examined the influence of cultural factors, such as language preferences, cultural attitudes toward technology, and perceptions of online learning. Finally, it assessed how digital literacy and cultural factors, combined with online training, impact workforce productivity, job satisfaction, and skill development among frontline workers in India.

Both sections of the questionnaire utilized Likert-type scales to measure participants' responses, providing a standardized method for capturing the necessary data for analysis.

Table 1 illustrates the scale development used in the study. The construct of Digital Literacy captures respondents' proficiency and confidence in using digital tools and technologies for learning and work-related tasks. Cultural Factors reflect the impact of language, societal norms, and learning preferences on the effectiveness of online training. The Online Training construct assesses the accessibility, relevance, and contribution of digital learning programs to skill development and attitudinal change. Finally, Productivity encompasses aspects of employee motivation, competence, and workplace support. Together, these constructs form a comprehensive framework for analyzing the relationship among digital literacy, cultural factors, and workforce productivity.

3.4. Sampling

This study will use purposive sampling to select frontline workers in India who have experience with online training. Participants will be chosen based on their involvement in online training, digital literacy, and their role in the workforce. This approach ensures that the sample is relevant to the research on digital literacy, cultural factors, and productivity. The sample size will be determined by data saturation.

3.5. Data Collection and Sample

Data has been collected through an online survey administered to frontline workers in India, specifically targeting nurses, paramedics, doctors, and AAA (ANM, ASHA, AWW). The survey was distributed via email and online platforms to ensure accessibility across various levels of digital literacy. The sample size was determined using the Cochran formula (Cochran, 1997), which is widely accepted for calculating sample sizes in studies. A total sample of 603 participants was successfully gathered. Data collection was concluded once the desired sample size was reached.

4. DATA ANALYSIS, RESULTS AND DISCUSSION

In Table 2, demographic data provides valuable insights into the composition of the sample population across various categories. The gender distribution shows a slight female majority, with 51.74% females and 48.26% males, indicating a relatively balanced representation between the genders. Age-wise, most

Table 1: Scale development

Construct	Statements	Citation
Digital Literacy	I am confident in browsing, searching, and filtering digital content to enhance my learning and job performance. I regularly use cloud storage services or external drives to manage and access digital training materials. I verify the sources of the information I find before applying it in my work-related tasks. I choose digital tools and technologies for collaborative processes and teamwork. I am able to solve a technical problem or decide what to do when technology does not work during online training or work-related tasks.	Cetindamar et al., 2024
Cultural Factors	The language used in online training modules is a barrier to my understanding. My societal and cultural values sometimes make it difficult to relate to the content of online training. Differences in access to and familiarity with technology in my community affect my ability to use online training effectively. The learning style used in online training programs does not match my preferred way of learning.	Lim, 1999
Online Training	The online training provides enough learning opportunities in new technologies. It helps me gain knowledge of new technologies and build new skills. The online training has improved my attitude toward using new technologies at work It has helped me better understand my roles and responsibilities at work. The online training is easy to access and fits well with my daily work schedule.	Nicolás-Agustín et al., 2024
Productivity	I am willing to take initiative and put extra effort into completing my work tasks. I have the necessary skills and knowledge to perform my job effectively. My work environment supports me in being productive and focused. I have a positive and cooperative working relationship with my colleagues.	Cetindamar et al., 2024

Table 2: Demographic table

Demographics	Subcategory	Frequency	Percentage
Gender	Male	291	48.26
	Female	312	51.74
Age	21 years-30 years	122	20.23
	31 years-40 years	244	40.47
	41 years-50 years	183	30.35
	50 years above	61	10.12
Academic Qualification	Intermediate	304	50.41
	Graduation	183	30.35
	Post Graduation	91	15.09
	Other	30	4.98
Year of Experience	0–10 years	183	30.35
	10–20 years	304	50.41
	20–30 years	122	20.23
Occupation	Nurses	183	30.35
	Paramedics	122	20.23
	Doctors	91	15.09
	AAA (ANM, ASHA, AWW)	207	34.32

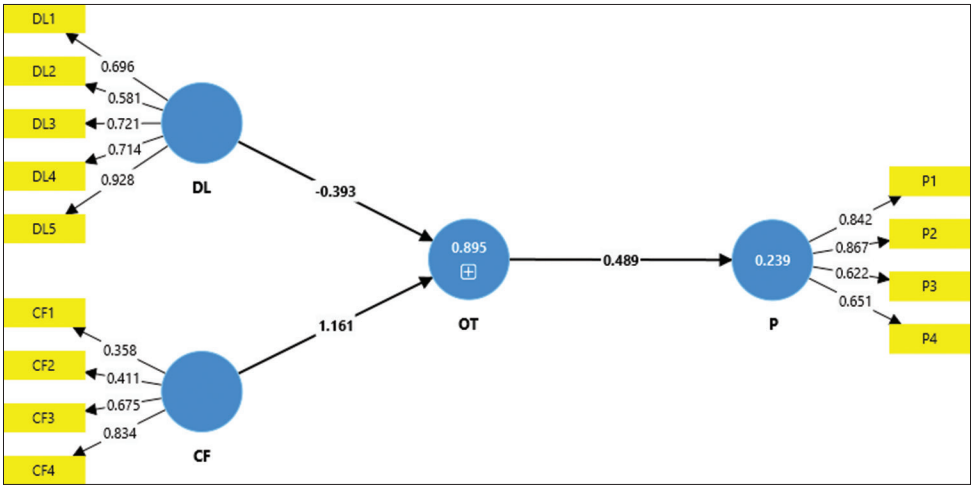
Table 3: Measurement model

Construct	Item code	Construct loadings	Composite reliability	AVE	Cronbach alpha	VIF
Cultural factors	CF1	0.758	0.87	0.762	0.703	1.489
	CF2	0.811				1.606
	CF3	0.775				1.364
	CF4	0.834				1.265
Digital literacy	DL1	0.896	0.853	0.543	0.864	2.194
	DL2	0.781				2.094
	DL3	0.721				2.333
	DL4	0.714				2.358
	DL5	0.928				1.348
Online training	OT1	0.755	0.853	0.539	0.852	1.903
	OT2	0.782				1.871
	OT3	0.779				2.155
	OT4	0.753				1.552
	OT5	0.793				1.715
Productivity	P1	0.842	0.837	0.568	0.839	1.91
	P2	0.867				1.908
	P3	0.722				1.872
	P4	0.851				1.856

individuals fall within the 31–40 years range (40.47%), followed by those aged 41–50 years (30.35%), highlighting a workforce primarily in mid-career stages. The younger 21–30 years group comprises 20.23% of the sample, while only 10.12% are 50. In terms of academic qualifications, the largest proportion holds intermediate education (50.41%), followed by 30.35% with a graduation degree, and 15.09% with post-graduation qualifications. A smaller group (4.98%) has other types of qualifications. Regarding years of experience, half of the sample (50.41%) has 10–20 years of professional experience, suggesting a relatively seasoned workforce. Those with 0–10 years of experience represent 30.35%, and only 20.23% have over 20 years of experience. The occupational breakdown reveals that nurses (30.35%) and community health workers, such as ANM, ASHA, and AWW (34.32%), make up the largest portions of the sample. Paramedics (20.23%) and doctors (15.09%) represent smaller segments, indicating that the sample is heavily oriented toward community-based healthcare roles rather than specialized medical practitioners. Overall, the data suggests a workforce with a strong presence of community healthcare workers, particularly nurses, with a balanced representation of genders and a majority in the mid-career age range with intermediate educational qualifications.

Table 3 provides an analysis of the measurement model for four constructs: Cultural Factors, Digital Literacy, Online Training, and Productivity. For Cultural Factors, all items (CF1 to CF4) demonstrate strong loadings, ranging from 0.758 to 0.834, indicating their good representation of the construct. The composite reliability of 0.87 suggests a high level of internal consistency, while the AVE of 0.762 signifies that the items explain a substantial portion of the variance. The Cronbach Alpha of 0.703 further supports the reliability of the construct, and the VIF values, ranging from 1.265 to 1.606, indicate no issues with multicollinearity. Digital Literacy also shows strong item loadings, particularly for DL1 (0.896), though DL5 has a slightly lower

Figure 1: SEM model for hypothesis testing



loading (0.714). The composite reliability of 0.853 and Cronbach Alpha of 0.864 reflect strong internal consistency and reliability. The AVE of 0.543 is slightly above the recommended threshold of 0.5, indicating a moderate level of variance explained by the items. The VIF values, ranging from 1.348 to 2.358, suggest that there is no significant multicollinearity among the items. For Online Training, the loadings of items (OT1 to OT5) range from 0.753 to 0.793, indicating good quality indicators. The composite reliability of 0.853 and Cronbach Alpha of 0.852 further support the construct's reliability, while the VIF values range from 1.552 to 1.903, showing no signs of multicollinearity. Finally, for Productivity, item loadings range from 0.722 to 0.867, with composite reliability of 0.837 and Cronbach Alpha of 0.839, indicating a good level of reliability. The VIF values are also within acceptable limits, ranging from 1.856 to 1.91, further supporting the absence of multicollinearity. Overall, the measurement model demonstrates strong construct validity and reliability across all constructs.

Table 4 presents the discriminant validity of the constructs using the Fornell-Larcker criterion. This criterion suggests that the square root of the Average Variance Extracted (AVE) for each construct should be higher than the correlation between that construct and others to establish discriminant validity. The Cultural Factors (CF) construct has an AVE of 0.602, and its correlations with Digital Literacy (DL), Online Training (OT), and Productivity (P) are 0.667, 0.899, and 0.543, respectively. The high correlation between CF and OT (0.899) may indicate a potential overlap between these constructs. Digital Literacy (DL) has an AVE of 0.737, with correlations of 0.667 with CF, 0.381 with OT, and 0.515 with P, all of which are within acceptable limits, indicating good discriminant validity. Online Training (OT) has an AVE of 0.734, with correlations of 0.899 with CF, 0.381 with DL, and 0.489 with P. The high correlation with CF (0.899) may suggest a need for further evaluation of discriminant validity between these two constructs. Finally, Productivity (P) has the lowest AVE value of 0.753, but its correlations with the other constructs (CF = 0.543, DL = 0.515, OT = 0.489) are all acceptable and do not raise concerns about discriminant validity. Overall, the discriminant validity of the constructs is mostly satisfactory, though the strong correlation between CF and OT warrants further investigation.

Table 4: Discriminant Validity of Fornell and Larker

	CF	DL	OT	P
CF	0.602			
DL	0.667	0.737		
OT	0.899	0.381	0.734	
P	0.543	0.515	0.489	0.753

Table 5: Discriminant validity of the HTMT criterion

	CF	DL	OT	P
CF				
DL	0.766			
OT	0.841	0.372		
P	0.583	0.511	0.486	

Table 5 presents the discriminant validity of the constructs using the Heterotrait-Monotrait Ratio (HTMT) criterion. This criterion is another method for assessing discriminant validity, where HTMT values above 0.90 indicate potential issues with discriminant validity, suggesting that constructs may not be sufficiently distinct from each other.

In this table, the off-diagonal values represent the HTMT ratios between the constructs. For Cultural Factors (CF), the HTMT values with the other constructs are 0.766 with Digital Literacy (DL), 0.841 with Online Training (OT), and 0.583 with Productivity (P). These values are below the threshold of 0.90, indicating that CF is sufficiently distinct from the other constructs in the model. For Digital Literacy (DL), the HTMT values with CF, OT, and P are 0.766, 0.372, and 0.511, respectively. These values suggest that DL is well-distinguished from the other constructs. Online Training (OT) shows HTMT values of 0.841 with CF, 0.372 with DL, and 0.486 with P, all of which are below 0.90, confirming discriminant validity. Lastly, Productivity (P) has HTMT values of 0.583 with CF, 0.511 with DL, and 0.486 with OT, which are well below the 0.90 threshold, indicating that P is distinct from the other constructs as well.

In summary, all HTMT values are below the 0.90 threshold, suggesting that the constructs in this model have good discriminant validity according to the HTMT criterion.

Table 6: Structural model hypothesis testing and results

Hypothesis	Path	Original sample (O)	Sample mean (M)	Standard deviation	T statistics	P values	Result
H_1	Cultural factors -> Online Training	0.763	0.764	0.032	24.075	0	Accepted
H_2	Digital Literacy -> Online Training	−0.081	−0.079	0.038	2.127	0.033	Accepted
H_3	Online Training -> Productivity	0.418	0.421	0.039	10.624	0	Accepted

In Figure 1, the PLS-SEM model illustrates the relationships among Digital Literacy (DL), Cultural Factors (CF), Online Training (OT), and Productivity (P). The measurement model shows that all constructs are well represented by their respective indicators, with most factor loadings above acceptable thresholds. The structural model indicates that Digital Literacy has a negative influence on Online Training ($\beta = -0.393$), suggesting that employees with higher digital skills may rely less on formal online training programs. In contrast, Cultural Factors have a strong positive impact on Online Training ($\beta = 1.161$), emphasizing the role of supportive cultural and contextual elements in enhancing training effectiveness. Online Training, in turn, positively affects Productivity ($\beta = 0.489$), demonstrating that effective online training contributes to improved employee performance. The R^2 values reveal that 89.5% of the variance in Online Training and 23.9% of the variance in Productivity are explained by their respective predictors, indicating a strong overall model fit and meaningful relationships among the constructs.

Table 6 shows the structural model results indicate that cultural factors have a strong and significant positive influence on online training ($\beta = 0.763$, $P < 0.001$), suggesting that a supportive cultural environment greatly enhances the effectiveness of online training among Anganwadi workers. Digital literacy, while significant ($\beta = -0.081$, $P = 0.033$), shows a weak negative relationship with online training, implying that more digitally literate workers may rely less on formal online training modules, possibly preferring alternative learning methods. Furthermore, online training has a moderate and significant positive impact on productivity ($\beta = 0.418$, $P < 0.001$), highlighting its crucial role in improving the performance of Anganwadi workers. Overall, the model supports the importance of cultural and training-related factors in enhancing worker productivity.

The study's results demonstrate that digital literacy and cultural alignment are key factors influencing the success of online training programs for India's frontline healthcare workers. A positive relationship was found between digital literacy and productivity, suggesting that workers who are more comfortable with digital platforms can benefit more from online training, leading to enhanced job performance. Similarly, cultural elements, including local language use, educational background, and attitudes toward technology, significantly influenced training engagement. Participants from rural areas or those with less exposure to English and digital tools found it more challenging to navigate training modules. This aligns with previous research and theories, such as Hofstede's cultural dimensions, which emphasize the influence of societal values and norms on learning and technology adoption. Furthermore, the demographic profile of respondents—most being mid-career workers with intermediate qualifications—highlights the need for training modules that are user-friendly and tailored to this group. The structural model results confirm the proposed constructs' reliability and the relationships' significance, reinforcing the critical role of the sociocultural context in digital learning effectiveness.

5. CONCLUSION

The study concludes that digital literacy and cultural sensitivity play a crucial role in determining the effectiveness of online training for India's frontline healthcare workers. Workers with higher levels of digital competency and access to culturally appropriate training content show better learning outcomes and improved productivity. On the other hand, those lacking digital skills or exposed to culturally misaligned training materials face significant learning barriers. Therefore, online training programs must be developed focusing on inclusivity in terms of technology use and cultural relevance to maximize impact across diverse worker groups. This approach can bridge the digital divide and ensure that all healthcare workers are equally equipped to perform effectively in a digitally evolving healthcare system.

5.1. Implications

This research has several practical and theoretical implications. From a practical standpoint, the findings highlight the need for policymakers and training providers to design modules that reflect regional languages and cultural norms. Such customization will enhance training participation and effectiveness, especially in rural or underserved regions. There is also a strong case for investing in digital literacy initiatives to ensure frontline workers are better equipped to access and use online training resources. Blended learning approaches, combining digital modules with face-to-face support, may further aid in overcoming digital and cultural barriers. From a theoretical perspective, the study contributes to the literature by empirically validating the importance of integrating sociocultural and digital factors into training models, particularly in developing economies like India. It supports calls for expanding traditional technology adoption frameworks to include behavioural, social, and cultural dimensions.

5.2. Limitations and Future Research

Despite the valuable insights offered, the study has certain limitations. It focuses solely on the healthcare sector, which may limit the generalizability of the results to other industries such as education, agriculture, or manufacturing. Additionally, the data was collected through self-reported online surveys, which may introduce bias due to participants' subjective perceptions or social desirability effects. The study's cross-sectional design also restricts the ability to capture training effectiveness or productivity changes over time, which could be important for understanding long-term impacts.

Future research can address these limitations in several ways. A longitudinal approach could be adopted to study the long-term effects of digital training on productivity and skill retention. Moreover, qualitative research, such as in-depth interviews or focus group discussions, can offer a deeper understanding of the emotional and experiential aspects of training, particularly concerning cultural sensitivities. Comparative studies across sectors or states with differing cultural and digital infrastructures can enrich the findings and broaden their applicability. Finally, experimental designs can be used to test new models of culturally adaptive and digitally accessible training frameworks, offering actionable strategies for future implementation.

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