Advances in Consumer Research
https://acr-journal.com/
Volume-3 | Issue-4 |April 2026
Original Researcher Article

School Infrastructure, Digitalisation, and Human Capital Formation: A Study of Government Schools in Odisha

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ABSTRACT

This study examines how school infrastructure and digitalisation influence teachers' motivation and subsequent student engagement in government schools in Odisha. Using a quantitative cross-sectional design, data were collected from a multistage stratified random sample of 384 teachers representing urban, rural, and tribal regions. The survey assessed perceptions of infrastructure adequacy, digital preparedness, leadership and technical support, teachers' motivation, ICT-integrated teaching practices, student engagement, and perceived learning outcomes. The analysis employed descriptive statistics, reliability testing, Confirmatory Factor Analysis (CFA), and Structural Equation Modeling (SEM) to evaluate measurement validity and test hypothesised relationships. The findings indicate that adequate physical infrastructure and strong digital readiness significantly enhance teachers' motivation, particularly when supported by effective leadership and institutional encouragement. Motivated teachers are more likely to adopt ICT-integrated pedagogies, which in turn positively influence student engagement and perceived learning outcomes. The results also highlight the mediating role of teachers' motivation and ICT practices in linking infrastructural and digital resources to student outcomes, as well as the moderating role of leadership support in strengthening these relationships. Despite positive perceptions overall, the study identifies gaps in consistent ICT implementation, suggesting the need for continued investment and capacity building. The research contributes to the literature by providing an integrated perspective on how physical, technological, and organisational factors collectively shape teaching practices and learning experiences. It concludes that sustained investment in infrastructure, digital ecosystems, and supportive leadership is essential for building inclusive, resilient, and future-ready education systems that foster equitable human capital development.

Keywords: School Infrastructure, Digitalisation, Teachers' Motivation, ICT Practices, Student Engagement.

INTRODUCTION:

A significant factor in facilitating individual development and economic advancement is education. For numerous years, economists have endeavoured to comprehend how schooling facilitates economic growth (Acemoglu, 2009), (Jones & Vollrath, 2002). Additionally, Nevertheless, The Solow model (1956) and other early economic development models primarily addressed growth in relation to capital and labor. (Mankiw et al., 1992) Therefore, Subsequently, they incorporate human capital into a production factor, demonstrating that education enhances workers' skills and productiveness. But (Romer, 1990) Recent "endogenous growth" theories suggest that education can foster innovation and technological advancements, hence enhancing economic prosperity over time. Consequently, from this perspective, education is not merely a means to get greater wealth, but also a long-term investment that benefits society as a whole. Therefore, an effective education system require robust school infrastructure and advanced digital resources. Moreover, Research indicates that the physical environment in schools strongly affects student learning outcomes including teacher efficacy. For example, (Barrett et al., 2019) Additionally, report that school with well classrooms, light, sanitation, and learning spaces had high student accomplishment. Additionally, Comfortable and well-equipped environments motivate both teachers' and students to put in the best performance (Matashu, 2022). Moreover, Digitalization has gained considerable importance in recent years. Technology is progressively utilized for purposes beyond mere instruction. Hence, It may also assist teachers' in personalizing instruction and monitoring students' advancement (Fernández et al., 2025). Studies have shown that the appropriate use of ICT tools can give rise to a moderate improvement in learning outcomes (Timotheou et al., 2023). Digital technologies facilitate the monitoring of attendance, test scores, along with student engagement in schools, thereby enabling data-driven decision- making. In the current landscape, superior education must prioritize physical infrastructure equally with preparedness for digital learning (Obioma, 2023).

Individuals perceive education as a valuable investment in human capital. Human capital, according to (Becker, 1975) and (Schultz, 1961), has generally been viewed as embodying the skills and knowledge, including health, that make people more productive. Investment in

education increases earnings and contributes to national economic growth. Teachers' quality and school infrastructure enhance these effects. (Hanushek, 2011) showed that improve teachers' quality, even by replacing the lowest-perform 5–8% with average ones, could generate huge longsighted-term economical gain. (Chetty et al., 2014) found that good teachers' raise students' future earnings and education levels. Infrastructure matters a lot: schools with better buildings and natural light help students perform better. These studies taken together show that investment in teachers' and infrastructure produces the highest returns through an improvement in learning and building stronger human capital.

India's National Education Policy (NEP) 2020 realizes the same. It promises to increase the spending on education to 6% of GDP, universalization of education, and digitalization of learning through initiatives like Digital India, PM e-Vidya, and Samagra Shiksha Abhiyan (Ministry of Education, 2020; Drishti IAS, 2024). But the gap between what has been targeted and the reality is immense. There are only 52% of school that have computer and 54% with an cyberspace facility, and rural schools are far from equal to urban schools (Save, 2025). Odisha, like many states, had additional problems: limited access to broadband (65.3%), lower Gross Enrolment Ratio of 22.1%, and nearly 40% vacancy of teaching positions (OdishaPlus, 2025). The situation in the tribal areas is even more dismal, as there is a high dropout rate and most of them face barriers due to language and other resources (Odisha TV, 2024; Academia.edu, 2020).

Additionally, despite these challenges, Odisha has made significant progress in recent years. Nevertheless, the state government initiated the 5T Initiative—Teamwork, Technology, Transparency, Transformation, and Time—to ensure efficient governance and effective service delivery. Nevertheless, The High School Transformation Programme (Government of Odisha, 2019) provide smart classrooms, e-libraries, and scientific laboratories to almost 7,000 high schools. The Mo School Abhiyan engaged alumni and community members in enhancing educational institutions. Consequently, Odisha is ranking in the School Education Performance Grading Index improved from 14th to 5th in 2023–24. Furthermore, However, significant disparities persist regarding the accessibility of online resources and educators for individuals in rural and tribal regions like as Malkangiri, Kandhamal, and Nabarangpur. Only 18.5% of schools nationwide possess internet access, although 47.3% of urban schools have. Nevertheless, Therefore, A limited number of residences in the country possess computers. This study integrates Human Capital Theory represented by (Becker, 1975), (Schultz, 1961) and (Mincer, 1958) Nonetheless, respectively, in understanding how school infrastructure and digitalization contribute to human capital formation in government schools of Odisha. Therefore, This research is new as it utilizes a holistic approach that incorporates infrastructural adequacy, digital readiness, leadership support, teacher motivating, along with student engagement as interconnected elements affecting educational quality and productivity. Nevertheless, this study highlights the interplay between physical and digital resources alongside human and institutional factors in improving learning environments and promoting equitable outcomes, contrasting with prior studies that analysed these aspects in isolation. Hence, Nevertheless, this research focuses on Odisha is changing educational landscape, offering a fresh viewpoint on how contemporary infrastructure, digital inclusion, and supportive leadership collectively improve teacher effectiveness and direct students towards inclusive and sustainable human capital development, in line with India is educational transformation goals.

LITERATURE REVIEW

School Infrastructure and Educational Outcomes

Furthermore, Hence, the subsequent part expands upon these theoretical concepts by examining empirical data about the impact of school infrastructure, digitalization, and teacher motivating on learn outcomes and human capital development. Consequently, Therefore, the Caliber of education and student performance are significantly affected by the school is infrastructure. Moreover, Studies across many educational levels indicate that access to decent classroom, laboratory, library, and sanitation facilities enhance academic achievement. (Mwikali, 2024) Additionally, Therefore, stated that effective utilisation of school facility was marginally associated with students' academic accomplishment, indicate that a well-maintained and clean physical environment facilitates learning. Similarly, (Ali, 2024) Moreover, Furthermore, Demonstrated that in Pakistan, the quality of classrooms, the accessibility of learning resources, and technological support significantly enhanced both teacher effectiveness and student productivity. (Bihag & Apolinario, 2026) Nevertheless, demonstrate that improved educational infrastructure in Indonesia, including the renovation of classroom and provision of digital devices, resulted in enhanced academic performance. Moreover, the results jointly support the idea that investing in physical infrastructure is a crucial method for improve instructional effectiveness along with student learning.

Digitalisation and Technology Integration in Education

Furthermore, Contemporary educational technology has transformed classrooms globally into environments where students can collaboratively study and interact with one another. According to (Ndukwe & Daniel, 2020), (Sánchez-Mena et al., 2019), TEL enhances instructional quality and scholar learning outcomes if implement effectively. However, successful implementation depends highly on digital readiness, which is defined as the assessment of the potential and capability of teachers' and their students in using technology. (Okoye et al., 2022) showed that teachers' must be digitally competent and supported by adequate infrastructure to seamlessly transition from face-to-face to purely online modes of teaching. In developing regions, poor connectivity, inadequate devices, and unequal distribution remain critical obstacles to effective digital adoption. (Iqbal, 2024) also discovered that in Bangladesh, teachers'' willingness to use ICT remains constrained by infrastructural and institutional barriers. Similarly, (Beardsley et al., 2021) note that exposure to technology

during the COVID-19 pandemic has increased motivation and confidence among teachers' to use technology, while (Khan et al., 2017) illustrate how students in rural areas are curious and more engaged when instruction is based on ICT. In spite of these benefits, (Alenezi et al., 2023) and (Van De Werfhorst et al., 2022) point out that the primary persistent barrier involve unequal access, limited opportunities for training, and socioeconomic disparities that help widen digital learning gap. Therefore, These determinations underscore the fact that although ICT presents opportunities for pedagogics, assessment, and instructional outcomes, its effectivity depends on equitable infrastructure, teacher readiness, and ongoing institutional supporting.

Leadership, Teachers' Motivation, and School Effectiveness

Nonetheless, Effective schooling leadership is crucial for enhancing the institution and transforming educational practice. Consequently, Additionally, Leaders who provide a clear vision, resources, as well as encourage foster a collaborative culture and stimulate innovation. (Alenezi et al., 2023) emphasized that leadership is crucial for steering digital transformation by foster professional developing and ensuring that technology aligns with educational objectives. Furthermore, Supporting from leadership increase the likelihood of teachers' utilizing ICT-based practices. (Naz & Rashid, 2021) Consequently, Hence, discover that educators exhibit greater enthusiasm, commitment, and satisfaction in their role when supported by efficient instructional leadership. Therefore, Teachers' motivating is as essential as students' motivating for effective teaching and scholar succeeder. (Nahid et al., 2023) discovered that motivated teachers enhance student engagement and facilitate improved learning outcomes. (Beardsley et al., 2021) Furthermore, They note that teachers' trustingness in utilizing digital technologies heightened throughout the pandemic. This indicates that educators are more inclined to utilize ICT in their instruction, and that the institution overall is more efficient when they have continuous exposure, training, and assistance about it. Nonetheless, most prior research has examined infrastructure, digital readiness, and teachers' motivation independently. Few have investigated the interaction of these factors on educational outcomes in Indian government schools, particularly in regions like Odisha. Addressing this gap can enhance our comprehension of how to render education more equitable and effective.

RESEARCH GAP

Most of the literature has looked separately at school infrastructure, digitalisation, and teachers' motivation as distinct determinants of educational outcomes. Regarding digitalisation, most research has focused on challenges related to a lack of resources, poor training, and unequal access, while research related to infrastructure has mostly been conducted with the focus being on direct impacts of infrastructure on student achievement rather than an indirect path via teachers' motivation and integration of ICT. Likewise, studies on teachers'' motivation have rarely considered that supportive school environments, well-developed technological infrastructures, and knowledge positively impact teachers'' dispositions for adopting ICT- enhanced pedagogies.

This study fills these gaps by taking an integrated perspective and investigates infrastructure adequacy, digital readiness, and leadership or technical support as mutually reinforcing

enablers of teachers' motivation and ICT-embedded teaching practices. Setting its focus on government schools in Odisha a context often characterized by large disparities in resource availability and digital inclusion the present research provides novel empirical insights into how the collective functioning of educational inputs relates to teachers' motivation, student engagement, and perceived learning outcomes, hence informing both theoretical and policy understanding of human capital formation in emerging education systems.

Theoretical Foundation

Human Capital Theory asserts that education is a vital investment that cultivates individual potential and fosters national economic progress. Rooted in the works of (Becker, 1975), (Schultz, 1961), and (Mincer, 1958), this concept posits that education, training, and skill development constitute forms of capital that generate long-term economic benefits, similar to investments in physical capital. These scholars argued that improved education increases worker productivity, thereby enhancing earnings and promoting economic growth.

Over time, the theory has evolved to explain income disparities across nations, labor markets, and economic growth patterns. Recent studies highlight the continued relevance of human capital in both developing and industrialized economies. For instance, (Leoni, 2025) demonstrates the relationship between human capital and human capability, emphasizing that education not only enhances productivity but also improves individuals' health and their capacity to contribute meaningfully to society.

METHODOLOGY

Research Design

Nevertheless, A cross-sectional survey was employed to examine the influence of school infrastructure and digitalization on teacher motivating and student engagement in government school in Odisha. The methodology allows researchers to concurrently sample educators and evaluate infrastructural adequacy, digital preparedness, motivation, pedagogical strategies, and student outcomes inside their genuine educational contexts. Nevertheless, this method is good for analysing genuine-time view and identifying crucial teaching–learning factor. Furthermore, the figure 1

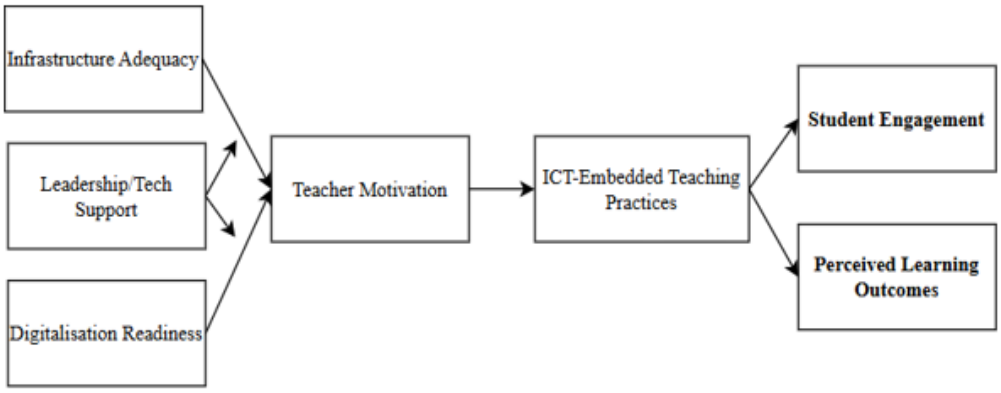


Figure 1: Conceptual Frame work

demonstrates how infrastructure, digital preparedness, and leaders support impact teacher' motivation, ICT-based teaching technique, and student result.

Sampling Procedure and Participants

Moreover, We used a multistage stratified sampling method to make sure that people from all over Odisha were included. First, districts were chosen, then blocks, then schools, and finally teachers in those schools. Additionally, 384 teacher from government institutions were selected to represent diverse environments, include urban, rural, and tribal or distant regions. All participants engaged independently and were not required to disclose their identities. This facilitated honestness among individual and reduced the likelihood of bias in their responses. Hence, This sampling method ensure that the results accurately represent the extensive population teachers in the state.

Instrumentation and Measures

A structured questionnaire was used to gather data, and it was given out on paper and through Google Forms. The questionnaire contain sections assessing infrastructure adequacy, digitalisation readiness, leadership and technical support, teachers' motivating, ICT-integrated teaching practice, student engagement, and perceived learning outcomes, in addition to fundamental demographic data. We used a 5-point Likert scale to rate all of the statements, and some of them were reverse-scored to keep people from answering in a pattern. The instrument assessed teachers'' perceptions of the school environment, their levels of motivation, their ICT- based instructional practices, and their perspectives on student engagement and learning.

Data Analysis Techniques

The data analysis comprised three primary processes. First, descriptive statistics were assessed to outline the general trends in teachers'' perceptions of infrastructure, digital facilities, motivation, teaching practices, and student outcomes. Additionally, Second, the results of reliability and CFA were checked to confirm the measurement model is quality. Finally, the proposed relationships between the variables were tested using Structural Equation Modeling (SEM). Nevertheless, SEM allowed the analysis of how infrastructure and digital readiness influence teachers' motivation, how motivated teachers' employ ICT in the classroom, and how teaching practices affect students' engagement and learning outcomes. Mediation and moderation analyses were also conducted to test the indirect effects and the role of leadership support. Moreover, Clustered standard errors accounted for teachers' nested within schools, while subgroup analyses for tribal and remote schools were used to check robustness.

RESULTS

Descriptive statistics for the study's primary variables derived from 384 teachers' answers as shown in Table 1

Table 1: Descriptive Statistics

	Infrastructure Adequacy	Digitalisation Readiness	Leadership Tech Support	Teachers' Motivation	ICT Embedded Teaching Practices	Student Engagement	Perceived Learning Outcomes
Valid	384	384	384	384	384	384	384
Mean	3.7135	3.7427	3.7014	3.6424	3.4573	3.7583	3.6682
Std. Deviation	.68096	.79163	.78208	.81293	.71511	.79340	.72467

and Figure 2.

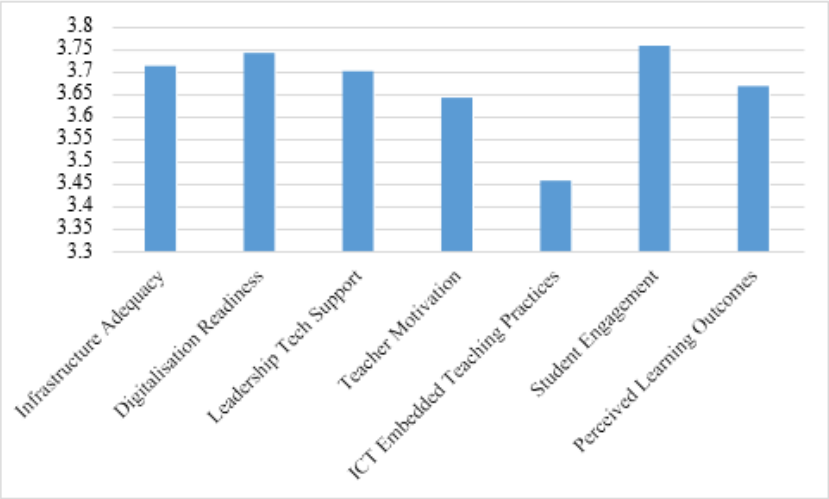
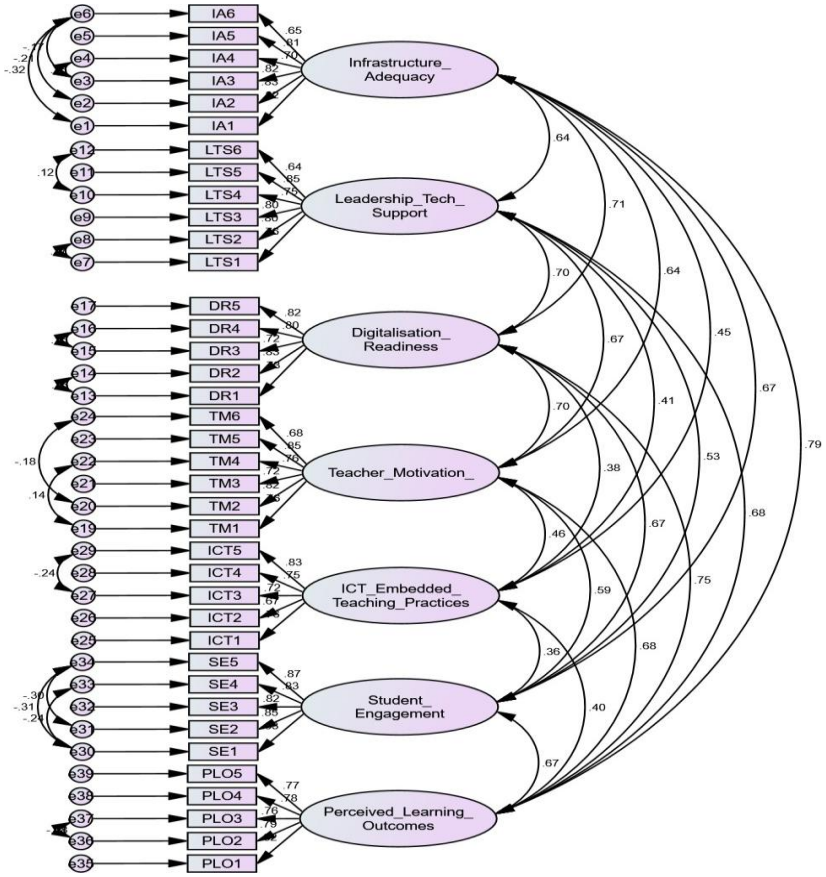


Figure 2: Mean scores of key study variables



All of the variables' mean values are above the scale's midpoint, indicating that respondents' views are typically favourable. The greatest mean (M = 3.76) was found for student engagement, suggesting that pupils are seen to be actively participating in class. Digitalisation Readiness (M = 3.74) and Infrastructure Adequacy (M = 3.71) come next, indicating that schools are comparatively well-equipped in terms of digital support systems and technology availability. Additionally, Leadership Tech Support has a positive level (M = 3.70), indicating that school leadership is seen as promoting technology integration. Positive teachers' morale and student learning achievement are indicated by the fairly high levels of Teachers' Motivation (M = 3.64) and Perceived Learning Outcomes (M = 3.67). ICT-Embedded Teaching Practices had the lowest mean (M = 3.46), indicating a possible area for improvement as it indicates that while infrastructure and preparedness are present, actual ICT usage in classroom teaching is somewhat less common. The replies' modest variability is shown by the standard deviations.

Confirmatory Factor Analysis (CFA)

Confirmatory Factor Analysis (CFA) is a statistical technique used to test whether a set of observed items correctly represents the underlying latent constructs proposed by theory. In CFA, the researcher specifies in advance which items belong to which factors (e.g.,

infrastructure adequacy, teachers' motivation, student engagement), and the model checks how well the data fit this structure. It provides factor loading to demonstrate the extent to which each item embody its construct, ensuring the reliability and vapidness' of the measuring modelling prior to progress to full SEM.

Consequently, Additionally, the confirmatory factor analysis indicates that all items show significant loading on their corresponding latent variables, hence providing strong evidence of convergent validity for the measurement model as shown in Table 2.

Table 2: Regression Weights: (Group number 1 - Default model

Path			Estimate	S.E.	C.R.	P
IA1	<---	Infrastructure Adequacy	.817			***
IA2	<---	Infrastructure Adequacy	.828	.052	18.619	***
IA3	<---	Infrastructure Adequacy	.822	.055	18.381	***
IA4	<---	Infrastructure Adequacy	.702	.054	14.943	***
IA5	<---	Infrastructure Adequacy	.809	.048	18.177	***
IA6	<---	Infrastructure Adequacy	.650	.069	11.698	***
LTS1	<---	Leadership Tech Support	.760			***
LTS2	<---	Leadership Tech Support	.798	.058	17.693	***
LTS3	<---	Leadership Tech Support	.801	.065	15.988	***
LTS4	<---	Leadership Tech Support	.745	.062	14.708	***
LTS5	<---	Leadership Tech Support	.852	.063	17.078	***
LTS6	<---	Leadership Tech Support	.637	.077	12.350	***
DR1	<---	Digitalisation Readiness	.734			***
DR2	<---	Digitalisation Readiness	.828	.064	17.264	***
DR3	<---	Digitalisation Readiness	.721	.072	13.478	***
DR4	<---	Digitalisation Readiness	.800	.069	15.021	***
DR5	<---	Digitalisation Readiness	.822	.071	15.511	***
TM1	<---	Teachers' Motivation	.758			***
TM2	<---	Teachers' Motivation	.820	.067	16.405	***
TM3	<---	Teachers' Motivation	.723	.068	14.352	***
TM4	<---	Teachers' Motivation	.763	.060	16.611	***
TM5	<---	Teachers' Motivation	.853	.066	17.287	***
TM6	<---	Teachers' Motivation	.682	.070	13.266	***

ICT1	<---	ICT-Embedded Teaching Practices	.764			***
ICT2	<---	ICT-Embedded Teaching Practices	.668	.064	12.973	***
ICT3	<---	ICT-Embedded Teaching Practices	.725	.064	13.348	***
ICT4	<---	ICT-Embedded Teaching Practices	.749	.062	14.714	***
ICT5	<---	ICT-Embedded Teaching Practices	.833	.066	15.645	***
SE1	<---	Student Engagement	.830			***
SE2	<---	Student Engagement	.848	.048	18.988	***
SE3	<---	Student Engagement	.818	.048	18.417	***
SE4	<---	Student Engagement	.830	.055	17.316	***
SE5	<---	Student Engagement	.875	.056	18.161	***
PLO1	<---	Perceived Learning Outcomes	.815			***
PLO2	<---	Perceived Learning Outcomes	.788	.051	17.161	***
PLO3	<---	Perceived Learning Outcomes	.759	.053	16.298	***
PLO4	<---	Perceived Learning Outcomes	.784	.050	17.259	***
PLO5	<---	Perceived Learning Outcomes	.765	.051	16.711	***

Hence, the factor loadings for Infrastructure Adequacy span from 0.650 to 0.828, indicating that each signal significantly contributes to the latent component. Moreover, The Leadership Tech Support item also load well (0.637–0.852), with LTS2, LTS3, and LTS5 having the high loading. Furthermore, this indicates that the scale consistently measures supportive, technology-focused leadership. Additionally, Additionally, the loadings of the Digitalisation Readiness items range from 0.721 to 0.828, indicating that the indicators reliably reflect schools' preparedness for digital initiatives. The Teachers' Motivation items exhibit loadings rate from 0.682 to 0.853, whereas the ICT-Embedded Teaching Practices item demonstrate loadings between 0.668 and 0.833. Nevertheless, this indicates that both the motivational and pedagogical components of technology usage are well assess. The constructions centered on students have superior measuring characteristics. The loadings for Student Engagement item vary from 0.818 to 0.875, whereas the loadings for Perceived Learning Outcomes items range from 0.759 to 0.815. All factor loadings exceed the recommended threshold of 0.60, and their critical ratios are large and statistically significant at $p < 0.001$ (***), indicating that the indicators are reliable and significantly associated with their respective latent variables, and that the overall measurement model is suitable for subsequent SEM analysis.

The overall Structural Equation Model demonstrated an acceptable to good fit to the data as shown in Table 3.

Table 3: Model fit summary

Variable	Value
Chi-square value(χ^2)	1030.323
Degrees of freedom (df)	629
CMIN/DF	1.638
P value	0
NFI	0.9
IFI	0.958
CFI	0.958
RMR	0.035
RMSEA	0.041

The chi-square statistic was 1030.323 with 629 degrees of freedom, yielding a χ^2/df ratio of 1.64, which falls within the recommended range below 3, indicating a well-fitting model. The incremental fit measures were also satisfactory, with NFI = 0.90 and both IFI and CFI = 0.958, suggesting that the specified model provides a substantial

improvement over the null model and achieves a very good comparative fit. The residual-based indices further support this conclusion: the RMR value of 0.035 indicates small average residuals, and the RMSEA value of 0.041 is below the commonly accepted threshold of 0.05, reflecting a close approximate fit of the model to the population covariance structure. Taken together, these indices confirm that the measurement and structural specifications provide an adequate representation of the observed data and are suitable for interpreting the hypothesised relationships among infrastructure adequacy, digitalisation readiness, leadership support, teachers' motivation, ICT- embedded practices, and student outcomes.

The demonstrates strong reliability and convergent validity for all constructs as shown in Table 4.

Table 4: Reliability and validity Test

Variables	Cronbach's Alpha	AVR	CR
Infrastructure Adequacy	0.889	0.681	0.857
Digitalisation Readiness	0.894	0.673	0.854
Leadership Tech Support	0.895	0.67	0.853
Teachers' Motivation	0.895	0.672	0.853
ICT Embedded Teaching Practices	0.86	0.643	0.812
Student Engagement	0.914	0.751	0.855
Perceived Learning Outcomes	0.884	0.689	0.832

Cronbach's alpha values range from 0.860 to 0.914 well above the 0.70 threshold indicating high internal consistency. Composite reliability (CR) values are all ≥0.812, exceeding the recommended 0.70 level. AVE values range from 0.643 to 0.751, surpassing the 0.50 criterion and confirming that each construct explains more than half of the variance in its indicators. Notably, Student Engagement shows the strongest convergent validity (AVE = 0.751, α = 0.914), while ICT- Embedded Teaching Practices has the lowest but still acceptable AVE (0.643). Overall, the measurement model meets accepted psychometric standards.

Table 5

Table 5: Summary of Hypothesis Testing Results for Structural Model

S. no	Hypothesis	Coef Value	P-value	Result
1	Infrastructure Adequacy ----------> Teachers' Motivation	0.654	***	Hypothesis Accepted
2	Digitalisation Readiness ----------> Teachers' Motivation	0.693	***	Hypothesis Accepted
3	Teachers' Motivation----------->ICT-Embedded Teaching Practices	0.458	***	Hypothesis Accepted
4	ICT-Embedded Teaching Practices ----------->Student Engagement	0.369	***	Hypothesis Accepted

5	ICT-Embedded Teaching Practices ---- >Perceived Learning Outcomes	0.399	***	Hypothesis Accepted
	Teachers' Motivation and ICT-Embedded Teaching Practices jointly mediate the relationship between Infrastructure Adequacy and student outcomes	0.573	***	Hypothesis Accepted
		0.405	***	
		0.26	***	
		0.031	***	
		0.27	***	
		0.47	***	
		0.555	***	
6		0.022	***	
	Teachers' Motivation and ICT-Embedded Teaching Practices jointly mediate the relationship between Digitalisation Readiness and student outcomes	0.612	***	Hypothesis Accepted
		0.351	***	
		0.253	***	
		0.077	***	
		0.279	***	
		0.422	***	
		0.47	***	
		0.08	0.039	
	Leadership/Tech Support positively moderates the relationship between Infrastructure Adequacy and Teachers' Motivation	0.389	***	Hypothesis Accepted
		0.437	***	
8		0.093	***	
	Leadership/Tech Support positively moderates the relationship between Digitalisation Readiness and Teachers' Motivation	0.432	***	Hypothesis Accepted
		0.402	***	
9		0.065	***	

presents the outcomes of the hypothesis testing conducted by structural equation modelling. The findings indicate that both Infrastructure Adequacy (β = 0.654) and Digitalisation Readiness (β = 0.693) exert a substantial and substantial plus influence on Teachers' Motivation. Additionally, this indicates that schools equipped with adequate resources and digital support enhance teachers' willingness to utilize ICT. Moreover, Teachers' Motivation significantly influence ICT-Embedded Teaching Practices (β = 0.458), indicate that motivated educators are more likely to incorporate digital resources into their pedagogical approaches. Nevertheless, the results demonstrate that the adoption of ICT-based teaching practices significantly improves Student Engagement (β = 0.369) and Perceived Learning Outcomes (β = 0.399). Moreover, Furthermore, the mediation analysis confirms that Teachers' Motivation and ICT-Embedded Teaching Practices jointly playact a critical role in transmit the effect of both Infrastructure Adequacy and Digitalisation Readiness on student outcome. Moreover, Hence, Leadership and technological supporting importantly influenced the relationships between teachers' motivation and both infrastructural and digital preparedness. Additionally, Consequently, this illustrate the implication of school leaders being supportive and motivate to enhance ICT usage.

DISCUSSION

Nonetheless, Furthermore, Nevertheless, the study indicated that sufficient school facilities and proficient usage of digital tool were substantial factor influence teacher' integration of ICT in their classes. When schools possessed the appropriate tools, a reliable internet connection, and a conducive digital environment, it enhanced teachers' confidence and increased their propensity to utilize technology in the classroom. Moreover, Moreover, this discovery support Human Capital Theory, which asserts that investing in educational resource increases production, and motivational theories, which propose that encouragement and acknowledgment promote performance. The study revealed that motivated teachers employ ICT more effectively, enhancing the dynamism and enjoyment of teaching, hence facilitating greater scholar engagement and learning. Hence, the result

indicate that supportive leadership further enhances teachers' motivating by provide them with guidance and technical aid. Therefore, Nevertheless, the research emphasize that enhance infrastructure and technology, along with engaged educator and good leadership, are crucial for improving the quality of education in schools.

CONCLUSION

This study reveal that at Odisha is government schools, a synergy of robust infrastructure, digital readiness, and effective leadership enhanced the engagement of both educator and pupils. Nevertheless, Nonetheless, the determination indicated that educator exhibited much great motivation when provide with sufficient facilities and dependable internet connecter. This result in a heightened utilisation of ICT-based pedagogic method that engage students more effectively. Furthermore, Moreover, the implemented tactic positively influence the reported learning outcomes and scholar engagement. Therefore, Furthermore, technological supporting and leadership have served as moderating variables by fostering environs that promotes innovation and confidence among educators. Nevertheless, this study indicate that ensure schools are prepared for the future to facilitate equitable and sustainable human capital development necessitate significant fiscal investing in digitalization and infrastructure, engage educator, and inspiring leaders.

CONFLICT OF INTEREST

The author(s) declare that there are no conflicts of interest.

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