



## Re-examining the Impact of Human Capital on Employee Performance: Evidence from ODL Institution

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### ABSTRACT

This study investigates the role of human capital capabilities in the context of an Open and Distance Learning (ODL) institution (where teaching and support services are offered via digital platforms) on employee performance. Based on Human Capital Theory, human capital was defined using three proxies: digital pedagogy, virtual communication capability, and adaptive capability. A descriptive cross-sectional survey was conducted using Google Forms among teaching and non-teaching staff of the National Open University of Nigeria, and 201 valid responses were collected from a population of 5,008. The results of multiple regression analysis show that digital pedagogy ( $B = 0.142$ ,  $p = 0.004$ ), virtual communication capability ( $B = 0.566$ ,  $p = 0.001$ ), and adaptive capability ( $B = 0.168$ ,  $p = 0.023$ ) have significant positive effects on employee performance, with virtual communication capability having the strongest positive effect. The model accounted for a large proportion of the variance in employee performance ( $R^2 = 0.579$ ;  $F = 90.516$ ,  $p < 0.01$ ). This research has implications for ODL managers to focus on developing staff capabilities in digital pedagogy, enhance virtual communication practices and tools, and establish continuous adaptation processes. Theoretically, the findings support the resource-based view and dynamic capabilities theory that capability-rich employees are strategic performance assets in turbulent digital environments. This research contributes to ODL knowledge by decomposing human capital into ODL-specific capability sets and exploring their relationships with employee performance in a technology-driven distance learning environment.

**Keywords:** Human Capital, Digital Pedagogy, Virtual Communication; Capability Adaptive, Employee Performance, ODL Institution.

**JEL Codes:** J24, I25, M54

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## 1. INTRODUCTION

The performance of employees remains a key indicator of organisational performance since it demonstrates the ability of employees to accomplish their duties in a manner that supports the organisational objectives. Performance in contemporary workplaces is no longer perceived as the accomplishment of the given tasks; it entails situational and adaptive behaviours such as teamwork, responsiveness, innovation, and the ability to adapt to the changing job demands (Sonnentag & Frese, 2002). This is especially critical in an institution which offer open and distance learning programmes, academic and non-academic employees work together to enhance the quality of teaching, student satisfaction, efficiency in administration, and long-term sustainability of the institution.

The development of human capital is generally acknowledged as one of the determinants of employee performance. Based on the Human Capital Theory, investments in education, training, skills development, and work experience reinforce the productive potential of employees, which subsequently improves the performance outcomes (Becker, 1964; Schultz, 1961). Studies have always indicated that organisations that strategically build the knowledge and skills of their employees are likely to perform better, particularly in knowledge-based and service-based industries where intangible assets are the key players (Crook *et al.*, 2011). In this sense, human capital is not just a set of qualifications, but a dynamic ability that defines how people use knowledge, make judgments, and solve complicated problems.

In the context of higher education, the significance of human capital is further compounded by the rapid technological change, the development of new teaching models, and the increase in the expectations of stakeholders. Therefore, ODL institutions should then continuously develop staff capacity on topics such as digital pedagogy, assessment integrity, student engagement, and data-informed decision-making. In turn, the performance of employees is becoming more dependent on the effectiveness of human capital development programs in accordance with the new demands arising in the workplace (Teixeira *et al.*, 2021). These facts are especially pronounced in Open and Distance Learning (ODL) institutions, where teaching, learning, and administration processes are mostly mediated by technology. In contrast to conventional universities, ODL institutions are based on virtual platforms, decentralised work arrangements, and high and heterogeneous student populations.

The academic personnel are supposed to provide teaching remotely, redesign course content to be used in online courses, and offer prompt feedback through learning management systems. Meanwhile, professional and administrative employees are part and parcel of student support services, assessment coordination, learning technology management, and regulatory compliance, which may be under heavy pressure and with limited face-to-face contact (Maimela, 2016). Though the literature acknowledges the wider societal role of ODL institutions in increasing access to education and enhancing the development of human capital, little has been done on how human capital is developed in ODL institutions themselves, and especially in the context of employee performance (Aoki, 2012; Bozkurt *et al.*, 2015).

A lot of the studies in the field focus on student performance, pedagogical planning, or the efficiency of technology, but the performance of the staff is comparatively neglected. When the problems that involve the employees are discussed, they are usually put in the context of general performance management issues as opposed to the human capital specifications that

are required to be effective in the technology-intensive, distance-based settings (Maimela, 2016). Moreover, most of the research that has been conducted to determine the relationship between human capital and performance is based on general measures such as educational attainment or training frequency, without considering the competencies that are specific to ODL environments. These are knowledge of digital pedagogy, virtual communication, knowledge of learning analytics, and the capacity to adjust to ongoing technological and policy shifts.

Similarly, the performance of employees is often considered as a one-dimensional phenomenon, and the contextual and adaptive aspects that are particularly important in the ODL settings are neglected (Sonntag & Frese, 2002). Although there are a lot of theoretical and empirical studies that confirm the existence of a positive relationship between human capital and employee performance (Becker, 1964; Schultz, 1961; Crook *et al.*, 2011), there is still a significant institutional gap.

The development of human capital in context-specific situations and its impact on multidimensional employee performance, comprising of task, contextual, and adaptive, is a poorly studied area with limited research directly investigating how human capital development is mediated by context in the context of Open and Distance Learning institutions, where technology-based processes make them unique compared to traditional higher education settings (Sonntag & Frese, 2002; Maimela, 2016). This paper seeks to fill these gaps.

To begin with, most of the current research on human capital-performance studies focuses on either the private sector or conventional organisational settings and thus provides little information about ODL institutions with unique structural and technological features (Crook *et al.*, 2011). Second, previous studies seldom separate human capital into the dimensions that are relevant to ODL, including digital pedagogical competence, virtual communication capability, adaptive capacity, and technology-enabled service delivery skills, and it is not clear which capabilities have the most significant impact in this context. Third, performance has been conceptualised in a limited way, focusing on task accomplishment without paying much attention to the contextual and adaptive factors that are particularly significant in ODL settings, where the system is constantly updated, student enrolment is high, and work is conducted at a distance (Sonntag & Frese, 2002).

Lastly, there has been a lack of focus on non-academic staff, though they play an important role in ensuring operational efficiency, improving student experiences, and institutional credibility in ODL systems. Consequently, there is insufficient empirical evidence explaining how and through what mechanisms human capital development translates into improved employee performance within ODL institutions. In lieu of the above shortcomings, the present study tends to re-examine the impact of human capital investment strategies on employee performance in open and distance learning environments. The structure of the paper is as follows: except for the introductory aspect in Section 1, Section 2 presents a literature review and the development of the hypotheses on the nexus between human capital and employee performance. Next, Section 3 is about the methodology; Section 4 is about the results. Lastly, section 5 is the conclusion of the paper.

## 2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

This part is a review of previous studies on the connection between human capital and employee performance in Open and Distance Learning (ODL) institutions. These schools are unique in their features: the process of teaching, evaluation, support of learners, and academic management are highly mediated by technology. Consequently, the performance of employees in ODL systems is not determined by formal qualifications only, but rather by the ability-based human capital (Schultz, 1961; Becker, 1964). According to Human Capital Theory, investments in education, training, and skills lead to productivity as it increases competence and efficiency of employees in performing their functions (Schultz, 1961; Becker, 1964). In strategic management terms, such digitally embedded competencies can be perceived as resources that have a direct impact on performance. Resource-Based View (RBV) asserts that organisations can achieve performance benefits when they have valuable and hard-to-imitate resources, including specialised employee expertise and know-how (Barney, 1991). Moreover, since ODL settings are dynamic, i.e., they are characterised by regular updates of the platform, policy changes, issues of academic integrity, and evolving expectations of the learners, the Dynamic Capabilities Theory implies that the continued performance depends on the institutional and individual capacity to reorganise routines and competencies in response to change (Teece, Pisano, and Shuen, 1997).

Employee performance is generally considered a multidimensional construct, which usually involves task performance, contextual performance, and adaptive performance. This is an important distinction since the successful execution of core functions (task performance) is not the same as the maintenance of the larger social and organisational environment (contextual performance). However, both are concerned with overall effectiveness (Borman & Motowidlo, 1993). Adaptive performance is also described as an independent dimension in modern frameworks as an indicator of how employees react to new circumstances and changing demands (Koopmans, 2014; Pulakos *et al.*, 2000). In ODL, the following dimensions are reflected: (i) the performance of online teaching and support tasks in a timely and accurate way (task performance), (ii) collaboration in distributed course teams and the display of service-oriented behaviours (contextual performance), and (iii) the capacity to react to technological disruptions and continuous changes (adaptive performance) (Koopmans, 2014; Pulakos *et al.*, 2000). Since the work of ODL is digitally mediated, the human capital is best described by capability-based indicators, which show how staff members teach in digital settings (digital pedagogy), how they organize and communicate virtually (virtual communication capability), and how they adjust to change (adaptive capacity) (Şimsimek *et al.*, 2021; Teece *et al.*, 1997).

The conceptualisation of digital pedagogy in empirical research is the capacity to design, facilitate, assess, and support learning through the use of digital tools and online methods. The data that is unique to ODL institutions demonstrates that scholars need powerful digital technology abilities to work successfully, which implies that digital pedagogical competence is structurally connected to work execution and performance in such systems (Enakrire *et al.*, 2025). Research in the context of distance learning universities also indicates that the profiles of educators in digital competence differ, which implies that the difference in capability may affect the quality and efficiency of digitally mediated practices (Moreira, Nunes, and Casanova, 2023). In a broader sense, the empirical evidence presents positive correlations between the

digital competence of educators and the job performance indicators, which support the assumption that a higher digital pedagogical competence will lead to better employee performance outcomes (Masias-Fernandez *et al.*, 2023).

## **2.1 Hypotheses development**

### **H1: Digital pedagogy positively influences employee performance in open and distance learning institutions.**

Since ODL delivery and learner support are carried out via digital systems, employees who are more digitally pedagogically competent are expected to show greater task and contextual performance by facilitating courses better, executing assessment workflow more efficiently, and responding to learners more responsively (Enakrire *et al.*, 2025; Moreira *et al.*, 2023). It is also expected that the positive relationship is expected due to the evidence showing that educator digital competence is positively associated with job performance outcomes (Masias-Fernandez *et al.*, 2023). Thus, the initial hypothesis is that the impact of digital pedagogy on the performance of employees is very strong and positive.

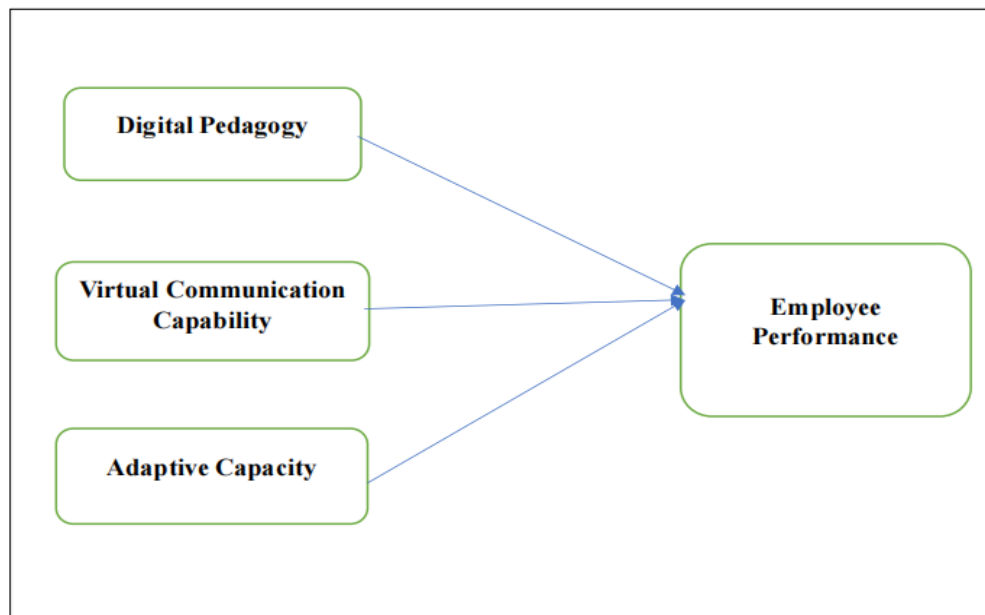
### **H2: Virtual communication capability has a significant positive effect on employee performance in open and distance learning institutions.**

Since ODL work is communication-intensive, employees who are better equipped to communicate virtually should coordinate better, handle learner problems more efficiently, and maintain a higher performance; this is what the media richness theory and the results obtained in the virtual team research that links communication/coordination to performance expect (Daft & Lengel, 1986; McLarnon *et al.*, 2019). The evidence of online education also confirms the relevance of performance of communication-enacted teaching presence (Martin *et al.*, 2022). Thus, the second hypothesis is put forward that the virtual communication capability positively influences the performance of the employees significantly.

### **H3: Adaptive capacity has a significant positive impact on employee performance in open and distance learning institutions.**

Since ODL environments are characterized by constant technological and procedural change, adaptive capacity must be able to help employees maintain performance in the face of novelty and disruption. The adaptive performance theory and empirical evidence that adaptability resources are linked to adaptation outcomes (Pulakos *et al.*, 2000; Rudolph *et al.*, 2017) and the evidence of remote work that predicts adaptive performance in digitally mediated work environments (Tan & Antonio, 2022) support this hypothesis. Thus, the third hypothesis is advanced that the adaptive capacity positively influences employee performance.

**Figure 1:** Conceptual Framework of the Study



**Source:** Adapted and remodified from Gedifew, & Muluneh, (2019).

## 2.2 Research Hypotheses

The following research hypotheses guided the study:

**H<sup>1</sup>:** Digital pedagogy positively influences employee performance in an open and distance learning institution

**H<sup>2</sup>:** Virtual communication capability has a significant positive effect on employee performance in an open and distance learning institution

**H<sup>3</sup>:** Adaptive capacity has a significant positive impact on employee performance in open and distance learning institutions.

## 3. METHODOLOGY AND DATA SOURCES

The research design adopted for this study was descriptive, which was deemed appropriate for the analysis of the relationships between human capital and employee performance. The data was collected using a structured questionnaire administered to the teaching and non-teaching staff of the National Open University of Nigeria (NOUN), thus ensuring a comprehensive coverage of the key stakeholders in the organisation. The questionnaire was constructed using Google Forms to ensure ease of access, wide distribution, and convenience for the respondents who were scattered in different study centres of NOUN across Nigeria. The instrument was distributed through the various academic and non-academic communication channels of the institution to ensure a high level of participation and response rate. A total of 201 valid responses were collected from a population of 5,008 teaching and non-teaching staff of NOUN. The sample size was statistically justifiable for organisational survey research with a finite population. Based on Yamane's formula for determining sample size for survey research, the sample size of this study was found to represent an acceptable margin of error of 7%, which is widely acceptable for explanatory and predictive research in the social sciences (Israel, 2013). The study employed multiple regression analysis to estimate the results

of the data collected from the respondents. The questionnaire used for this study consisted of three main sections.

Section A was used to capture the demographic information of the respondents for contextual understanding. Section B was used to gather information on Human Capital measures using three proxies. The section focused on the digital pedagogy, virtual communication capability, and adaptive capacity, on employee performance. The section focused on employee performance metrics, such as teaching quality, student satisfaction, administrative efficiency, and institutional sustainability, was employed. The responses were measured using a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). The validity and reliability of the questionnaire were strictly tested. The content validity of the questionnaire was tested using expert review. A pilot test was conducted to test the reliability and internal consistency of the instrument. Summated scale techniques were employed to test the internal consistency of the instrument. This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. The participation of the respondents was voluntary, informed consent was obtained, and respondent anonymity and confidentiality were fully ensured. The study did not involve human experimentation or laboratory procedures, as data were collected through a non-invasive questionnaire designed to pose no more than minimal risk to participants.

## 4. RESULTS

### 4.1 Descriptive Statistic

**Table 1: Descriptive Statistics**

| Variable                               | Category          | Frequency (n) | Percentage (%) |
|----------------------------------------|-------------------|---------------|----------------|
| <b>Gender</b>                          | Male              | 107           | 53.2           |
|                                        | Female            | 94            | 46.8           |
|                                        | <b>Total</b>      | <b>201</b>    | <b>100</b>     |
| <b>Marital Status</b>                  | Single            | 67            | 33.3           |
|                                        | Married           | 134           | 66.7           |
|                                        | <b>Total</b>      | <b>201</b>    | <b>100</b>     |
| <b>Age Group</b>                       | Below 30 years    | 53            | 26.4           |
|                                        | 31–40 years       | 51            | 25.4           |
|                                        | 41–50 years       | 61            | 30.3           |
|                                        | Above 50 years    | 36            | 17.9           |
|                                        | <b>Total</b>      | <b>201</b>    | <b>100</b>     |
| <b>Educational Qualification</b>       | Bachelor's degree | 121           | 60.2           |
|                                        | Master's degree   | 46            | 22.9           |
|                                        | Doctorate/Other   | 34            | 16.9           |
|                                        | <b>Total</b>      | <b>201</b>    | <b>100</b>     |
| <b>Years with Current Organisation</b> | 1–5 years         | 16            | 8              |
|                                        | 6–10 years        | 43            | 21.4           |
|                                        | 11–15 years       | 57            | 28.4           |
|                                        | 16–20 years       | 23            | 11.4           |
|                                        | Above 20 years    | 62            | 30.8           |
|                                        | <b>Total</b>      | <b>201</b>    | <b>100</b>     |

Source: Field Survey (2026)

Table 1 presents the demographic profile of the respondents and offers a useful background for understanding the composition of the study sample. The gender distribution is relatively balanced, with 53.2% male and 46.8% female participants. This near-equal representation reduces the likelihood of gender bias and enhances the overall representativeness of the findings. Regarding marital status, the majority of respondents (66.7%) are married, while 33.3% are single. This pattern suggests that most participants are likely in stable life phases, which may contribute to stronger work commitment, accumulated experience, and sustained organisational involvement. The age distribution indicates that respondents largely fall within economically active and professionally mature age groups. Individuals aged 41–50 years form the largest segment (30.3%), followed by those under 30 years (26.4%) and those aged 31–40 years (25.4%). Only 17.9% are above 50 years. This reflects a workforce that blends professional experience with active engagement in organisational and technological activities—an important factor in technology-driven and knowledge-intensive settings such as Open and Distance Learning (ODL) institutions. In terms of educational attainment, most respondents are highly qualified. A majority (60.2%) hold at least a bachelor's degree, 22.9% possess a master's degree, and 16.9% have doctoral or other advanced qualifications. This underscores the strong educational background of the workforce and supports the relevance of investigating human capital and IT capability within the institution.

Looking at organisational tenure, a considerable proportion of respondents have long-standing experience with their current organisation. Specifically, 28.4% have served for 11–15 years, 11.4% for 16–20 years, and 30.8% for more than 20 years. This demonstrates a high level of organisational stability and indicates that many respondents possess substantial institutional knowledge and experience, enabling them to provide well-informed evaluations of organisational practices, performance, and capabilities. Finally, the demographic profile points to a well-educated, experienced, and stable workforce. These characteristics enhance confidence in the reliability and validity of the data and make the sample suitable for examining the relationships among human capital, IT capability, and organisational performance within an Open and Distance Learning context.

#### Statistic 4.2 Cronbach Alpha Test

**Table 2: Cronbach Alpha Test**

| Construct                        | Cronbach_alpha | Interpretation |
|----------------------------------|----------------|----------------|
| Digital Pedagogy                 | 0.871          | Good           |
| Virtual Communication Capability | 0.728          | Acceptable     |
| Adaptive Capacity                | 0.767          | Acceptable     |
| Employee Performance             | 0.887          | Good           |

**Source:** Field Survey (2026)

Table 2 shows the internal consistency reliability of the study constructs in the form of Cronbach's alpha. The findings show that all the scales have acceptable to good reliability with alpha coefficients that are above the generally accepted minimum of 0.70. Digital Pedagogy (= 0.871) and Employee Performance (= 0.887) have good internal consistency, which implies that their items are consistent in measuring the underlying constructs. Virtual Communication

Capability (= 0.728) and Adaptive Capacity (= 0.767) also have acceptable reliability thresholds, which confirms that the items of each scale are coherent enough to be empirically analysed. The statistics of the reliability confirm the appropriateness of the measurement tools for further correlational and regression-based modelling.

**Table 3: Correlational Matrix**

| Variable | DP    | VCC   | AC    | EP    |
|----------|-------|-------|-------|-------|
| DP       | 1     | 0.416 | 0.664 | 0.511 |
| VCC      | 0.416 | 1     | 0.648 | 0.717 |
| AC       | 0.664 | 0.648 | 1     | 0.632 |
| EP       | 0.511 | 0.717 | 0.632 | 1     |

**Source:** Field Survey (2026)

Table 3 indicates the correlation matrix of all the study constructs with a positive relationship ( $r = 0.416$  to  $0.717$ ), which implies that greater digital pedagogy, virtual communication capability, and adaptive capacity are correlated with greater employee performance. Virtual communication capability has the best bivariate relationship with employee performance ( $r = 0.717$ ). Notably, intercorrelations between predictors do not exceed the usually mentioned warning levels of multicollinearity ( $r < 0.80$ ), implying that there is not much redundancy between constructs.

**Table 4: Multicollinearity Test**

| Predictor | VIF   | Tolerance |
|-----------|-------|-----------|
| DP        | 1.789 | 0.559     |
| VCC       | 1.725 | 0.58      |
| AC        | 2.55  | 0.392     |

**Source:** Field Survey (2026)

Table 4 indicates the multicollinearity diagnostics of the regression predictors with the Variance Inflation Factor (VIF) and tolerance. The findings show that there is no issue of multicollinearity. In particular, the values of VIF of Digital Pedagogy (VIF = 1.789), Virtual Communication Capability (VIF = 1.725), and Adaptive Capacity (VIF = 2.550) are significantly lower than the generally accepted threshold of VIF > 5 or 10. In contrast, the values of tolerance (0.559, 0.580, and 0.392) are much higher than the typical acceptable threshold (0.10 or 0.20). These statistics indicate that the predictors are not highly intercorrelated to inflate standard errors or destabilise coefficient estimates. This indicates that the model can be estimated with a high degree of reliability, and the individual effects of DP, VCC, and AC on the dependent variable can be interpreted with a lot of confidence.

**Table 5: Autocorrelation Test**

| Test                    | Statistic | p_value | Notes                                                             |
|-------------------------|-----------|---------|-------------------------------------------------------------------|
| Durbin–Watson           | 2.062     |         | ~2 suggests no first-order autocorrelation (cross-sectional data) |
| Breusch–Godfrey (lag 1) | 0.225     | 0.6351  | H0: no serial correlation                                         |
| Breusch–Godfrey (lag 2) | 0.313     | 0.855   | H0: no serial correlation                                         |

**Source:** Field Survey (2026)

Table 5 shows the outcomes of the autocorrelation diagnostics of the regression residues. The Durbin-Watson statistic is equal to 2.062, which is quite close to the standard value of 2, which shows that there is no indication of the first-order autocorrelation of the error terms. This is expected given that the data of the cross-sectional survey are supposed to be independent of each other. The Breusch-Godfrey LM test was also used to give a more general check. The test values are 0.225 ( $p = 0.6351$ ) and 0.313 ( $p = 0.855$ ) at lag 1 and lag 2, respectively. In each of the cases, the p-values are significantly higher than traditional significance levels (e.g., 0.05), i.e., the null hypothesis of no serial correlation cannot be rejected. The findings verify that the regression model meets the independence of errors assumption, and autocorrelation is not likely to cause bias in the estimated coefficients and standard errors.

### 4.3 Multiple Régression Analyses

**Table 6: Coefficient of Régression**

| Term     | B     | Std. Error | t     | p-value |
|----------|-------|------------|-------|---------|
| constant | 0.598 | 0.206      | 2.890 | 0.004   |
| DP       | 0.142 | 0.049      | 2.859 | 0.004   |
| VCC      | 0.566 | 0.064      | 8.795 | 0.001   |
| AC       | 0.168 | 0.073      | 2.291 | 0.023   |

**Source:** Field Survey (2026)**Table 7: Model Summary**

| Metric         | Value  |
|----------------|--------|
| N              | 201    |
| R-squared      | 0.579  |
| Adj. R-squared | 0.573  |
| F-statistic    | 90.516 |
| Prob(F)        | 7.4021 |
| AIC            | 267.35 |
| BIC            | 280.56 |
| Durbin-Watson  | 2.062  |

**Source:** Field Survey (2026)

**Table 8: AVOVA**

| Source     | SS     | df  | MS     | F      | p-value |
|------------|--------|-----|--------|--------|---------|
| Regression | 58.949 | 3   | 19.649 | 90.516 | 0.004   |
| Residual   | 42.765 | 197 | 0.217  |        |         |
| Total      | 101.71 | 200 |        |        |         |

**Source:** Field Survey (2026)

## 5. DISCUSSION OF EMPIRICAL RESULTS

Table 6 shows the findings of multiple regression analysis that investigates three elements of human capital, such as digital pedagogy, virtual communication capability, and adaptive capacity, on the performance of employees in an open and distance learning ecosystem. The independent variable in the model is the human capital, and the dependent variable is the employee performance. Three hypotheses that were tested were accepted. Hypothesis one ( $H_1$ ) demonstrates that digital pedagogy has a positive relationship with employee performance in Open and Distance Learning (ODL) institutions. Digital pedagogy is positively and statistically significantly related to employee performance. Substantively, the implication of this is that a 1-unit change in digital pedagogy, other things held constant, is linked to a 0.142-unit rise in employee performance. This finding is consistent with the existing evidence that better digital competence and online teaching capacity enhance work outcomes and job performance among educators and employees in the public sector working in digitised environments. As an illustration, research findings indicate positive correlations between digital competence and performance outcomes, even in education-related work environments. (Masias-Fernandez *et al.*, 2023 ; Jiang *et al.*, 2023 ; Ingsih *et al.*, 2024).

In addition, hypothesis two ( $H_2$ ) that Virtual communication capability is positively linked with employee performance in ODL institutions was also accepted. This finding indicates that virtual communication capability is the most predictive in the model (the greatest coefficient and t-statistic). With digital pedagogy and adaptive capability held constant, a 1-unit increment of virtual communication capability is linked to a 0.566 improvement in employee performance. This is conceptually and practically consistent in Open and Distance Learning (ODL) institutions: coordination (in terms of timeliness, clarity, responsiveness, presence) through the digital channels is critical to performance. Empirical studies of global, virtual teams have repeatedly indicated that communication and coordination systems are the key sources of performance in virtual teams (McLarnon *et al.*, 2019; Bhat *et al.*, 2017). Similarly, the studies of distance and online education also highlight the importance of communication management and presence as the keys to effectiveness (Kayode, 2018; Kim *et al.*, 2020; Tian *et al.*, 2021).

Lastly, hypothesis three ( $H_3$ ) was also accepted. The findings revealed that adaptive capacity has a positive, statistically significant impact on employee performance. Keeping the levels of digital pedagogy and virtual communication capability unchanged, an increase in adaptive capability by 1 unit foretells a 0.168 rise in employee performance. This coincides with a wide body of evidence that adaptability/adaptive performance is performance-relevant, particularly in the presence of disruption and remote/technology-mediated work. Adaptability resources are associated with meta-analytic evidence of positive adaptation outcomes such as performance (Rudolph *et al.*, 2017). Previous studies view adaptive performance as a

multidimensional capacity to facilitate effectiveness in changing demands (Pulakos *et al.*, 2000), and more recent empirical studies in periods of remote work associate telework functioning and commitment with adaptive performance (Tan, 2022; Sancho-Zamora *et al.*, 2021). The overall goodness-of-fit and omnibus significance of the multiple regression model predicting the performance of employees based on the digital pedagogy, the virtual communication capability, and the adaptive capacity are reported in Tables 7 and 8. The model shows a significant explanatory power ( $R^2 = 0.579$ ; Adjusted  $R^2 = 0.573$ ) and therefore the three predictors explain a significant 58 percent of employee performance variance, and the adjusted estimate is also relatively high, which is not due to over-parameterisation of the model complexity. The Durbin Watson value (2.062) is near the standard value of 2, and it suggests the absence of first-order residual autocorrelation, which is also in line with the independence assumption in cross-sectional survey data. The results of ANOVA (Table 8) also confirm that the regression is a much better fit compared to an intercept-only model.

In particular, the explained variation ( $SSR = 58.949$ ) is large and statistically significant compared to the unexplained variation ( $SSE = 42.766$ ), which results in a large and statistically significant omnibus test,  $F(3, 197) = 90.517$ ,  $p = 0.004$ . This F-test is based on the ratio of mean square regression (MSR)/mean square error (MSE) and whether the predictors together explain the outcome. Lastly, the AIC (267.35) and BIC (280.56) give information-criterion standards, which are mainly useful in comparing competing specifications (e.g., adding controls, nonlinear terms, or interaction effects); in such comparisons, a lower AIC/BIC value is associated with a more parsimonious balance of fit and complexity.

## 6. CONCLUSION

This study shows that digital pedagogy, virtual communication capability, and adaptive capacity each have positive and statistically significant effects on employee performance in an ODL institution. Though virtual communication capability has a dominant predictor, implying that performance in the ODL ecosystem is especially sensitive to communication-intensive coordination, such as clarity, responsiveness, and feedback quality within digitally mediated work systems. Next to virtual communication capability is the adaptive capability, which also exact positive and significant relationship with employee performance within the ODL institution. While digital pedagogy the least predictor of employee performance. This implies that institutional and employee performance in the ODL setting depends largely on the three disaggregated variables of human capital under investigation. The model fit is strong ( $R^2 = 0.579$ ; Adj.  $R^2 = 0.573$ ;  $F = 90.516$ ; Durbin–Watson = 2.062), and key diagnostics support credible estimation ( $VIF \leq 2.55$ ; tolerance  $\geq 0.392$ ). The study concludes that indices of human capital proxies by digital pedagogy, virtual communication capability, and adaptive capacity are positively, statistically, and significantly enhanced employee performance in the context of an open and distance learning institution under consideration.

### 6.1 Recommendations

Based on the findings from this study, the following recommendations were made:

- The digital pedagogy capacity-building, such as course design for ODL, online assessment integrity, and analytics-informed facilitation, should be institutionalised by the stakeholders in the open and distance learning institutions, as it is logical to the human capital investment.

- The policy makers and educational agencies should strengthen effective virtual communication architecture and norms: clear response-time standards, feedback rubrics, multi-channel communication protocols, and supervisor monitoring of service quality, given virtual communication capability's largest effect size.
- The management of the ODL environment should make sure to constantly develop adaptive capacity by planned change routines: quick training cycles of changes in LMS, cross-unit incident response teams, and continuous improvement loops for student feedback and LMS analytics, which is in line with dynamic capabilities.

## **6.2 Contributions to Knowledge**

This study added to the existing literature in ODL in the following ways. First, it offers institution-level data that disaggregates human capital capabilities to forecast employee performance in an ODL context, which fills a gap in which staff performance is usually marginal to research on distance education. Second, it also shows that virtual communication capability is the most performance-sensitive human capital mechanism in ODL, refining theory on what counts most to performance when work is digitally mediated. Third, the research goes beyond generic proxies of human capital by applying ODL-relevant capability bundles, including digital pedagogy, virtual communication capability, and adaptive capability in line with capability-based perspectives.

## **6.3 Implications of the Study**

This study provided theoretical implications, managerial implications, as well as policy implications: The findings reinforce Human Capital Theory's productivity claim (Becker, 1964; Schultz, 1961) while specifying that, in ODL, communication-intensive capability is a key pathway through which human capital translates into performance (RBV and dynamic capabilities). HRD and performance management in ODL should emphasise to managers (i) the development of communication capability, (ii) the development of structured training in digital pedagogy, and (iii) adaptive routines of platform and policy change as opposed to the primary focus of qualification or ad hoc training. The leadership of policy makers and regulators of ODL should consider staff capability development as a strategic quality lever to distance education outcomes, in line with the calls to redefine the role of human capital in higher education in the digital age.

## **6.4 Suggestions for Further Studies**

Future research should consider the use of longitudinal or panel studies to enhance causal inference using cross-sectional data. Future research needs to be done on multi-institution and cross-country samples to offer external validity on various ODL infrastructures. Other studies are also needed to analyse the mediators, such as technostress, job satisfaction, organisational support, and moderators' infrastructure quality, role type, workload, and leadership support, that are consistent with the unexplained variance of the model as implied by the implications of the study in this study.

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**Data Availability Statement:** The data supporting the findings of this study can be obtained from the corresponding author upon reasonable request.

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