

EMPIRICAL ARTICLE

Digital Transformation and Human Capital Development in an Emerging Market Telecommunication Industry: The Moderating Roles of Customer Experience, Operational Processes, and Business Model Innovation

Frank Boateng¹ | John Armstrong Asabil Etroo²

¹University of Mines and Technology (UMaT), Ghana

²Sametro Company Limited / SCL Sametro Guinea Bissau Sarl, Guinea Bissau

Correspondence

Frank Boateng, University of Mines and Technology, Ghana.

Email: fboateng@umat.edu.gh

Abstract

Purpose: Digital transformation (DT) has emerged as a transformative force reshaping organisational structures, operational models, and workforce capabilities across industries. Despite growing practitioner interest, the academic literature has paid limited attention to how DT influences employee human capital development (HCD), that is, the systematic enhancement of the knowledge, skills, and competencies of the organisational workforce, particularly in the telecommunications sector in emerging economies. Drawing on contingency theory, the resource-based view, and organisational learning theory, this study investigates the direct effect of DT on HCD and examines the moderating roles of customer experience, operational processes, and business model innovation in the Ghanaian telecommunication industry.

Design/methodology/approach: This study adopts a quantitative cross-sectional design, with data collected from 290 employees across three major telecommunications firms operating in Ghana, using structured questionnaires administered at the firms' head offices in Accra. Ghana's telecommunications sector provides a relevant, underexplored emerging-market context, characterised by rapid DT, intense competition, and a workforce facing significant digital upskilling demands under the regulatory oversight of the National Communications Authority.

Findings: Results indicate a positive direct effect of DT on HCD, with operational processes and customer experience significantly moderating this relationship. Contrary to expectations, business model innovation did not significantly moderate the DT-HCD nexus.

Originality/value: Whilst prior studies have examined DT-HCD largely in isolation or as a simple bivariate relationship, this study introduces and empirically tests three specific boundary conditions, namely customer experience, operational processes, and business model innovation, as moderators of the DT-HCD relationship, offering a more nuanced, conditional account of when and how DT drives HCD.

KEYWORDS

Digital Transformation; Human Capital Development, Business Model Innovation; Telecommunication Industry.

1 | INTRODUCTION

The accelerating pace of technological change has fundamentally reshaped how organisations compete, create value, and develop their workforces. Digital transformation, broadly defined as the integration

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of digital technologies to radically alter business processes, culture, and customer interactions (Vial 2019, Waskito and Mutaftiq 2026), has become a strategic imperative across sectors. In the telecommunications industry, firms have been at the vanguard of digital adoption, serving as both enablers of broader digital ecosystems and internal adopters seeking operational efficiency and competitive differentiation (Rahman and Ramzani 2025).

Human capital development, defined as the systematic enhancement of employees' knowledge, skills, and competencies (Mollah et al. 2025, Ismail 2026), is increasingly recognised as both a critical outcome and a prerequisite for successful digital transformation. As organisations digitise operations, introduce AI-enabled tools, migrate to cloud infrastructure, and deploy advanced analytics, demand for digitally capable employees intensifies (Trenerry et al. 2021, Bouwmans et al. 2024). Yet the academic literature offers an incomplete picture of how and under what conditions digital transformation translates into meaningful human capital development, particularly in emerging-economy contexts.

Ghana's telecommunications sector offers an instructive empirical context. Comprising three major operators, MTN Ghana, Vodafone Ghana (now Telecel Ghana), and AirtelTigo, the industry is characterised by rapid technological change, regulatory oversight by the National Communications Authority (NCA), intense competition, and a workforce facing significant digital upskilling demands. Despite the sector's dynamism, empirical evidence on the DT–HCD relationship within it remains scarce.

Despite the voluminous literature on digital transformation (DT) and its organisational consequences, two specific and inter-related research gaps remain unresolved. First, the DT literature has focused predominantly on firm financial performance (Guo and Xu 2021, Raposo et al. 2024), organisational agility (Baiyere et al. 2020), and product innovation as outcome variables, leaving the workforce consequences of digital transformation, particularly its effect on employee human capital development (HCD), theoretically and empirically underdeveloped. The limited studies that do engage with workforce outcomes have centred on job displacement and technological unemployment (Qureshi 2023), leaving the inverse and equally plausible pathway, in which digital transformation compels organisations to invest in employee capability development to extract full value from new technologies, largely unexamined. This gap is particularly relevant when considering AI-enabled systems and chatbots, which can both complement and challenge human capital development in emerging markets (Sahut et al. 2023, Lissilour and Sahut 2026, Monod et al. 2023). This displacement bias in the literature is particularly pronounced in the African context. Studies examining DT–HCD dynamics in sub-Saharan African telecommunications firms are virtually absent, despite the sector's rapid digital expansion and its status as both an engine and a test case of digital transformation in emerging economies (Rahman and Ramzani 2025, Ismail 2026). The nearest empirical precedents, as posited by Waskito and Mutaftiq (2026) in Indonesian SMEs and Mollah et al. (2025) in a post-COVID organisational context, confirm a positive DT–HCD relationship but do

not address the conditions under which it holds, and neither study is situated in a telecommunications or African context.

Second, and relatedly, existing theoretical treatments of the DT–HCD relationship assume a simple, unconditional direct effect, neglecting the boundary conditions that determine when and how strongly digital transformation yields human capital development outcomes. This theoretical gap is consequential: if the DT–HCD relationship is contingent on organisational and strategic moderators, as contingency theory would predict (Donaldson 2001), then models that ignore these moderators will yield biased estimates, misleading managerial prescriptions, and theoretically incomplete accounts. Three such moderating conditions are theoretically motivated but empirically untested: the customer-experience orientation of the firm's digital strategy, the agility of its operational processes, and the innovativeness of its business model. Whether these conditions amplify, attenuate, or conditionally activate the DT–HCD relationship remains an open empirical question.

Against this dual gap, the absence of an African telecom context and of moderating mechanisms, this study is motivated by a specific theoretical ambiguity: does digital transformation develop or displace employee human capital? The answer, this study argues, is neither universal; it depends on the organisational conditions under which transformation occurs. Drawing on contingency theory to justify the moderating design, the resource-based view (Barney, 1991) to position employee human capital as a strategic resource, and organisational learning theory to specify the process by which digital transformation compels capability development, this study proposes and tests an integrative, moderated framework in which the effect of digital transformation on employee human capital development is conditional on customer experience, operational processes, and business model innovation.

The study addresses four specific objectives:

1. to examine the direct effect of digital transformation on employee human capital development in Ghana's telecommunications sector;
2. to test the moderating effect of business model innovation on DT–HCD relationship;
3. to examine the moderating role of customer experience in DT–HCD relationship; and
4. to test the moderating effect of operational processes on DT–HCD relationship.

This paper makes several contributions. Theoretically, it extends the contingency and RBV frameworks to the DT–HCD nexus, identifying specific moderating mechanisms absent from prior models. Empirically, it offers original quantitative evidence from the Ghanaian telecommunications sector, an underrepresented context in the global DT literature. In practice, the findings provide telecommunications executives and HR professionals with evidence-based guidance for designing digital transformation initiatives that meaningfully build human capital. For policy-makers and the NCA, the results underscore the importance of aligning national digital transformation agendas with workforce development strategies.

2 | LITERATURE REVIEW

2.1 | Theoretical Framework

This study integrates three theoretical perspectives, namely contingency theory, the resource-based view (RBV), and organisational learning theory, to construct an explanatory framework for the relationship between digital transformation and employee human capital development. These three theories are selected not arbitrarily but because they address three analytically distinct questions that together constitute a complete causal account of the DT-HCD relationship: why the relationship is conditional (contingency theory); why firms should invest in human capital in response to digital transformation (RBV); and how digital transformation actually generates human capital development at the process level (organisational learning theory). The three theories are complementary rather than overlapping or conflicting. Each operates at a different level of analysis and addresses a different component of the research model, and none alone is sufficient to explain the full causal chain from digital transformation to conditional human capital development outcomes.

Contingency theory holds that the effectiveness of organisational strategies and practices is not universal but depends on the fit between those strategies and their context (??). It is the first and foundational theory in this framework because it provides the architectural rationale for the entire moderated model; if the DT-HCD relationship were direct and unconditional, neither moderating variables nor a contingency lens would be needed. Contingency theory predicts that customer experience orientation, operational process agility, and business model innovation constitute distinct organisational contexts that alter the boundary conditions under which digital transformation drives human capital development. Without contingency theory, there is no theoretical basis for the moderating hypotheses; it is the theory that motivates the study's central design choice.

The resource-based view (Barney 1991) operates at a different level; it explains why firms should invest in human capital development during digital transformation. RBV frames employee competencies as strategic resources that are valuable, rare, inimitable, and non-substitutable (VRIN), and which provide the foundation for sustained competitive advantage. Critically, RBV predicts that digital technologies alone do not generate competitive advantage; it is the human capital deployed alongside those technologies that is the source of inimitability, because competitors can acquire the same software, platforms, or infrastructure, but cannot easily replicate a firm's digitally capable workforce (Waskito and Mutafiq 2026). RBV thus provides the motivational logic, the "why" of the DT-HCD relationship: firms are theoretically compelled to develop employee human capital as a complement to digital investment precisely because that human capital is the VRIN resource that converts digital tools into competitive advantage. RBV does not, however, explain the process by which that development occurs; that is where organisational learning theory contributes.

Organisational learning theory (Argyris and Schön 1978) provides a process-level micro-mechanism that explains how digital transformation drives human capital development within the firm. When firms digitally transform, they introduce novel tools, workflows, and competitive challenges that cannot be addressed by existing competencies alone, triggering what Argyris and Schön term double-loop learning. This involves reframing organisational assumptions and deliberately developing new competencies to resolve the mismatch between existing capabilities and new technological demands (Dörner and Rundel 2021, Basten and Haamann 2018). This learning dynamic is the micro-process through which digital transformation translates into human capital development outcomes. Organisational learning theory answers the "how" question that RBV and contingency theory leave open.

Taken together, the three theories form an integrated and logically sequenced explanatory architecture: contingency theory explains why the DT-HCD relationship is moderated by organisational context; RBV explains why firms strategically invest in human capital development in response to digital transformation; and organisational learning theory explains the process by which digital transformation produces that development. Figure 1 illustrates the theoretical framework and the division of theoretical labour across the three components of the research model.

2.2 | Conceptual Overview

Digital transformation is a multidimensional concept that extends beyond the simple adoption of technology. It encompasses the fundamental re-engineering of business processes, customer relationships, and organisational structures through the integrated application of digital technologies, including artificial intelligence, cloud computing, big data analytics, the Internet of Things (IoT), and mobile platforms (Mergel et al. 2019, Vial 2019). Scholars distinguish digital transformation from the narrower concepts of digitisation (converting analogue to digital) and digitalisation (using digital technologies to improve existing processes), positioning it as a more comprehensive and disruptive organisational change (Trenerry et al. 2021).

In the telecommunications context, digital transformation is particularly consequential. Telecoms firms are not merely adopters of digital technology; they provide the backbone infrastructure on which the digital economy operates. As a result, their internal digital transformation, encompassing network virtualisation, customer journey redesign, and data-driven operational management, directly affects how employees are developed and deployed (Rahman and Ramzani 2025).

Human capital theory, originating with Schultz (1961) and Becker (1964), frames employees' knowledge, skills, and abilities as productive assets requiring systematic investment. Contemporary scholarship has broadened this conception to include digital competencies as a core dimension of human capital in the knowledge economy (Bouwman et al. 2024, Protasenko et al. 2025). Fareed et al. (2020) define

organisational-level human capital development as the deliberate enhancement of unit-level knowledge, skills, and abilities, arising from strategic organisational investment in employee capabilities.

In the context of digital transformation, human capital development assumes particular urgency. As firms introduce new digital technologies, they simultaneously create capability gaps in their workforce, namely the gap between employees' current competencies and those required to operate effectively in digitally transformed environments (Waskito and Mutaftiq 2026, Ismail 2026). Bridging these gaps through targeted training, upskilling, and development programmes is central to human capital development in the digital age (Trenerry et al. 2021, Mollah et al. 2025).

2.3 | Digital Transformation and Human Capital Development

The empirical literature on the DT-HCD nexus presents a nuanced picture. Several studies affirm a positive relationship, arguing that digital transformation creates demand for new skills and thereby motivates organisational investment in human capital (Waskito and Mutaftiq 2026, Mollah et al. 2025, Javed et al. 2025). Javed et al. (2025) demonstrate synergistic effects between digital capability and human capital development, finding that digitally capable organisations achieve stronger sustainability outcomes when supported by developed human capital and vice versa. Mollah et al. (2025) specifically examine digital leadership and find that human capital development partially mediates the relationship between digital leadership and organisational performance in a post-COVID-19 context.

From a critical perspective, Qureshi (2023) warns that digital transformation can exacerbate inequality unless accompanied by deliberate investment in human capital to democratise access to digital skills. This view reinforces the contingent nature of the DT-HCD relationship, suggesting that positive outcomes are not automatic but depend on how organisations manage the transformation process (Trenerry et al. 2021, Bouwmans et al. 2024).

2.4 | Moderating Variables

Customer experience is the internal, subjective response customers have when they come into direct or indirect contact with an organisation (Schwager and Meyer 2007). In the context of digital transformation, customer experience serves as both a primary driver and an evaluative criterion for digital initiatives (Masoud and Basahel 2023). When digital transformation is oriented towards improving customer experience, organisations are more likely to develop employees' competencies in areas such as digital customer service, omni-channel management, and data-driven personalisation (Ahmed 2025, Bhati 2025). The moderating hypothesis holds that a high customer experience orientation amplifies the positive effect of digital transformation on human

capital development, because customer-centric digital transformation necessitates deeper and broader employee capability development.

Operational processes are the transformation processes that convert inputs into outputs, such as products or services, that deliver value to customers (Horváthová and Davidová 2011). Research consistently shows that operational agility, the ability to reconfigure processes rapidly in response to changing environmental conditions, is both an enabler and an outcome of successful digital transformation (Hoque et al. 2026, Yang et al. 2021). Leadership behaviour is another critical determinant of workforce skill development, particularly in SMEs and emerging African contexts (Mensah et al. 2025, Vunobolki et al. 2025). In the Ghanaian telecommunications context, regulatory requirements from the NCA set baseline operational standards, while competitive dynamics compel firms to exceed these baselines through agile, digitally enabled processes. The moderating hypothesis posits that agile and dynamic operational processes strengthen the positive relationship between digital transformation and human capital development, as they require employees to continuously update their skills to operate within evolving process architectures.

Business model innovation involves the deliberate redesign of how a firm creates, delivers, and captures value (Zheng 2024, Judijanto 2025). In the context of digital transformation, it encompasses the introduction of new digital revenue streams, platform-based value propositions, and data monetisation strategies (Latifi et al. 2021). The theoretical expectation is that firms with innovative business models require more sophisticated employee capabilities aligned with new value-creation logics, thereby amplifying the DT-HCD relationship. However, empirical evidence on this moderating effect is limited and contested.

Based on the theoretical framework and literature review, the following hypotheses are proposed, as conceptualised in Figure 1:

- **H1:** Digital transformation has a significant positive effect on human capital development.
- **H2:** Business model innovation positively moderates the relationship between digital transformation and human capital development.
- **H3:** Customer experience positively moderates the relationship between digital transformation and human capital development.
- **H4:** Operational processes positively moderate the relationship between digital transformation and human capital development.

3 | RESEARCH METHODOLOGY

The study adopts a positivist, quantitative research paradigm, consistent with the paper's hypothesis-testing objectives and the deductive nature of the theoretical model. The positivist approach assumes that social phenomena are governed by discoverable regularities, which are best investigated through structured measurement and statistical analysis (Creswell 2013). A cross-sectional survey design was used to provide

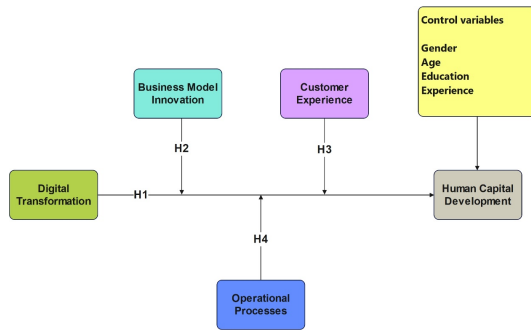


FIGURE 1 Conceptual Model of Digital Transformation and Human Capital Development (Source: Author's conceptualisation, 2026)

a snapshot of the DT-HCD relationship and its moderating conditions at a specific point in time within the Ghanaian telecommunications sector.

3.1 | Population and Sampling

The target population comprised employees of the three major telecommunications firms operating in Ghana: MTN Ghana, Vodafone Ghana (now Telecel Ghana), and AirtelTigo. These firms collectively account for the vast majority of mobile and broadband subscribers in Ghana and are the most digitally advanced in the domestic telecommunications landscape. Head office employees were selected as the sampling frame because they are most directly involved in the design, deployment, and daily operation of digital transformation initiatives, and are therefore best placed to assess the relationship between digital transformation and employee human capital development. Field-level and technical staff stationed outside the head office, whose work is primarily operational rather than transformation-oriented, were excluded from the sampling frame.

The total accessible population across the three head offices was estimated at 1,200 employees, based on staff establishment figures obtained from each firm's Human Resources departments prior to data collection. Using the Krejcie and Morgan (1970) sample size determination table and applying Cochran (1977)'s formula for a proportionate sample size at a 95% confidence level and a 5% margin of error, a minimum sample size of 291 was determined to be statistically adequate for the total population.

A purposive sampling strategy was used within the head office population, targeting employees in departments directly involved in digital transformation activities, including Information Technology, Operations, Marketing, Customer Experience, Strategy, and Human Resources. This criterion ensured that respondents had direct experiential knowledge of the firm's digital transformation initiatives and their workforce development implications, thereby enhancing the content validity of the survey responses (Creswell 2013).

Questionnaires were allocated proportionally across the three firms according to their estimated head office staff populations: MTN Ghana ($n = 210$), Vodafone Ghana ($n = 195$), and AirtelTigo ($n = 190$), for a total

of 595 distributed questionnaires. Distribution was facilitated through each firm's HR department, with questionnaires administered in person by the researcher during scheduled departmental visits over a six-week data-collection period. Participation was voluntary and anonymous, and respondents were assured of the confidentiality of their responses.

Of the 595 distributed questionnaires, 312 were returned, of which 22 were excluded due to incomplete responses or systematic response patterns indicative of inattentive answering, yielding 290 valid, usable responses and an effective response rate of 48.7%. Non-response bias was assessed by comparing the demographic profiles of early and late respondents, following Armstrong and Overton's (Armstrong and Overton 1977) procedure; no significant differences were found ($p > 0.05$), suggesting that non-response bias does not pose a material threat to the validity of the findings. Demographic analysis confirmed the sample's representativeness across gender, educational attainment, departmental affiliation, and years of work experience.

3.2 | Measurement and Data Analysis Procedure

Data were collected using a structured, self-administered questionnaire comprising five constructs: digital transformation (DT), human capital development (HCD), customer experience (CE), operational processes (OP), and business model innovation (BMI). All items were rated on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire items were adapted from validated scales in the extant literature to ensure content validity. Control variables, including respondent gender, age, educational level, work experience, and departmental affiliation, were included to account for demographic heterogeneity that may independently influence perceptions of digital transformation and human capital development outcomes.

Digital Transformation (DT) was measured using six items adapted from Vial (2019) and Mergel et al. (2019), capturing the extent to which the firm integrates digital technologies to fundamentally redesign business processes, customer interactions, and operational models. A representative item is: "Our organisation uses digital technologies to fundamentally redesign the way we deliver services to customers."

Employee Human Capital Development (HCD) was measured using five items adapted from Fareed et al. (2020) and Mollah et al. (2025), capturing the systematic enhancement of employees' knowledge, digital skills, and competencies through organisational investment. A representative item is: "My organisation regularly invests in training programmes to build employees' digital skills and capabilities."

Customer Experience (CE) was measured using five items adapted from Masoud and Basahel (2023) and Schwager and Meyer (2007), capturing the extent to which the firm's digital transformation strategy is oriented towards improving the quality, consistency, and personalisation of customer interactions. A representative item is: "Our digital transformation initiatives are primarily designed to improve the quality of the experience we deliver to customers."

Operational Processes (OP) were measured using five items adapted from Horváthová and Davidová (2011) and Yang et al. (2021), capturing the agility, efficiency, and responsiveness of the firm's internal transformation processes. A representative item is: "Our organisation continuously redesigns its operational processes to respond rapidly to technological and market changes."

Business Model Innovation (BMI) was measured using five items adapted from Kotarba (2018) and Latifi et al. (2021) to capture the extent to which the firm introduces new digital revenue streams, value propositions, and value delivery mechanisms. A representative item is: "Our organisation regularly introduces new business model elements enabled by digital technologies."

Following the approach of ?, procedural remedies for common method bias were employed during questionnaire design and administration: item wording was kept simple and non-leading; psychological separation was introduced between predictor and criterion items by ordering them in different sections of the questionnaire; and respondents were explicitly assured of anonymity and the absence of right or wrong answers, to reduce evaluation apprehension. The questionnaire was pilot-tested with 30 employees drawn from a telecommunication firm not included in the main study, and minor wording adjustments were made based on pilot feedback before the final instrument was administered.

Data analysis proceeded in several sequential stages. First, descriptive statistics and preliminary data cleaning were conducted in SPSS version 25 to address missing values, outliers, and normality. Second, Exploratory Factor Analysis (EFA) using Principal Component Analysis (PCA) with varimax rotation was performed to assess the factor structure of each construct and to confirm item retention. The Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity were used to assess the suitability of the data for factor analysis.

Third, Confirmatory Factor Analysis (CFA) was conducted using SPSS AMOS version 23 to assess measurement model fit, convergent validity, and discriminant validity. Model fit was assessed using multiple indices: χ^2/df , CFI, TLI, RMSEA, and SRMR. Construct reliability was assessed using Cronbach's alpha and composite reliability (CR), whilst convergent validity was evaluated using average variance extracted (AVE). Fourth, Covariance-Based Structural Equation Modelling (CB-SEM) was employed to test the structural model, including the direct effect of DT on HCD and the three moderating hypotheses. Hierarchical regression analysis was used to test the interaction effects.

4 | RESULTS

4.1 | Demographics

Table 1 presents the demographic profile of the 290 respondents. The sample was predominantly female (57.2%), with the largest age group in the 26–35 years range (62.8%). The majority held bachelor's degrees (76.2%), and most respondents were employed as supervisors

(49.0%) or officers (35.9%). The three participating telecommunications firms contributed roughly equal proportions of responses: MTN Ghana (31.0%), Vodafone Ghana (33.4%), and AirtelTigo (35.5%). Most respondents had 6–10 years of work experience (50.0%).

TABLE 1 Demographic Profile of Respondents

Category	Description	Frequency	Percentage (%)
Gender	Male	124	42.8
	Female	166	57.2
Age	≤25 years	26	9.0
	26–35 years	182	62.8
	36–40 years	74	25.5
	>40 years	8	2.8
Education	Senior High School	9	3.1
	Diploma/HND	31	10.7
	Bachelor's Degree	221	76.2
	Master's & above	29	10.0
Telecom Firm	MTN Ghana	90	31.0
	Vodafone Ghana	97	33.4
	AirtelTigo	103	35.5
Work Experience	1–5 years	88	30.3
	6–10 years	145	50.0
	11–20 years	50	17.2
	21–30 years	7	2.4

4.2 | Structural Model and Hypothesis Testing

Table 2 presents the path coefficients and significance levels for all hypothesised relationships. Three of the four hypotheses were supported.

The direct effect of digital transformation on human capital development (H1) was positive and significant ($\beta = 0.31, p = 0.042$), supporting H1. The structural model's coefficient of determination (R^2) was 0.47, indicating that the model explained 47% of the variance in human capital development. The moderating effect of customer experience (H3) was positive and significant ($\beta = 0.27, p = 0.008$), supporting H3. Similarly, operational processes (H4) produced a positive and significant moderating effect ($\beta = 0.34, p = 0.003$), supporting H4. However, business model innovation (H2) produced a significant but negative moderating coefficient ($\beta = -0.18, p = 0.031$), so H2 was not supported in the hypothesised direction.

5 | DISCUSSION

The positive and significant direct effect of digital transformation on employee human capital development (H1 supported) aligns with and extends the most closely related empirical precedents in the literature. Most directly, Waskito and Mutaftiq (2026) find a positive causal relationship between digital transformation and human capital development in Indonesian SMEs, concluding that strategic digital alignment is

TABLE 2 Summary of Hypotheses Test Results

Hypothesis	Path	β	p-value	Decision
H1	DT $\rightarrow$ HCD (Direct Effect)	0.31	0.042	Supported
H2	DT $\times$ BMI $\rightarrow$ HCD	-0.18	0.031	Not Supported (negative)
H3	DT $\times$ CE $\rightarrow$ HCD	0.27	0.008	Supported
H4	DT $\times$ OP $\rightarrow$ HCD	0.34	0.003	Supported

Note: DT = Digital Transformation; HCD = Human Capital Development; BMI = Business Model Innovation; CE = Customer Experience; OP = Operational Processes.

the strongest driver of advanced human capital formation. This finding closely mirrors the present result in the Ghanaian telecommunications context. Javed et al. (2025) similarly provide macro-level evidence of synergistic, self-reinforcing relationships between digital capability and human capital development across emerging economies, further corroborating H1.

These findings are also consistent with, though not directly parallel to, research on the related construct of digital leadership. Mollah et al. (2025) demonstrate that digital leadership, which captures the strategic and behavioural dimensions of managing digital transformation rather than the transformation itself, significantly influences human capital development, with HCD partially mediating the effect of digital leadership on organisational performance. Whilst digital leadership and digital transformation are conceptually distinct, Mollah et al.'s finding reinforces the broader conclusion that digitally oriented organisational strategies compel investment in employee capability development, providing indirect support for the positive DT–HCD pathway identified in the study.

These findings collectively challenge the job-displacement narrative that has dominated popular discourse on digital transformation. Rather than replacing employees, digital transformation in Ghana's telecommunications sector appears to create demand for more sophisticated employee competencies, prompting organisational investment in human capital development. This aligns with the RBV prediction that firms must develop corresponding human capital resources to exploit newly acquired digital capabilities (Barney 1991, Trenerry et al. 2021). Recent studies also show how crises and environmental shocks can influence the adoption of digital skills and sustainable behaviours across generations (Chebeñ et al. 2026).

The relatively modest coefficient ($\beta = 0.31$) and the fact that the direct effect was positive yet marginally significant suggest that digital transformation alone does not deterministically drive human capital development. The relationship is contingent on other organisational and contextual factors, a conclusion reinforced by the significant moderating effects of customer experience and operational processes.

5.1 | Moderating role of customer experience

The positive and significant moderating effect of customer experience (H3 supported; $\beta = 0.27$, $p = 0.008$) indicates that when organisations orient their digital transformation towards delivering superior customer experiences, the positive effect on human capital development is strengthened. This finding is theoretically coherent: customer-centric digital transformation necessitates broader and deeper employee capability development in areas such as digital customer service, AI-assisted complaint resolution, and omni-channel interaction management (Mansour and Basahel 2023, Ahmed 2025).

The result may also be explained by the fact that most respondents were customer service and frontline operational staff who interact with customers daily. When digital transformation directly affects their customer-facing processes, introducing new CRM platforms, chatbot interfaces, or mobile service delivery tools, these employees face the most immediate and pressing need to update their competencies. Bhati (2025) similarly documents that digital transformation initiatives oriented towards customer engagement create stronger pressures for workforce upskilling than internally focused automation initiatives.

5.2 | Moderating role of operational processes

The strongest moderation effect in the model was produced by operational processes (H4 supported; $\beta = 0.34$, $p = 0.003$). This finding supports contingency theory's prediction that the effectiveness of digital transformation in producing human capital development depends on the agility and dynamism of an organisation's operational processes. Two explanatory mechanisms are proposed.

First, the deregulated nature of Ghana's telecommunications market has created strong pressure to be operationally agile. Firms that operate with dynamic processes, continuously re-engineering workflows to maintain regulatory compliance and competitive positioning, create environments in which employee skill development is an ongoing operational necessity rather than a periodic investment. Hoque et al. (2026) find that operational resilience, closely related to operational agility, significantly moderates the relationship between strategic capabilities and performance in firms in emerging markets, consistent with the present finding.

Second, the high degree of inter-organisational connectivity in the Ghanaian telecommunications value chain, including interdependencies among mobile network operators, mobile money platforms, and retail distribution networks, means that digital transformation at one node of the chain creates cascading demands for human capital development at other nodes. Employees must therefore develop competencies that extend beyond their immediate operational roles, including an understanding of broader digital ecosystems and inter-firm data exchange standards.

5.3 | Non-significant moderating role of business model innovation

Contrary to H2, business model innovation produced a significant but negative moderating effect ($\beta = -0.18$, $p = 0.031$). This unexpected finding requires careful theoretical interpretation. Three explanations are offered. First, business model innovation in the Ghanaian telecommunications context may be characterised more by service portfolio diversification (e.g., mobile money, digital content services) than by a fundamental redesign of the value proposition. Such incremental business model adjustments may not generate sufficiently novel human capital demands to amplify the DT-HCD relationship and may, in fact, create organisational complexity that diverts managerial attention from human capital development (Zheng 2024).

Second, firms with highly innovative business models may already have high baseline levels of human capital, thereby reducing the marginal impact of digital transformation on further development. In other words, business model innovation may substitute for, rather than complement, the human capital development effects of digital transformation. Latifi et al. (2021) note that both business model innovation and human capital investment are resource-intensive, and that cash-constrained firms in emerging markets may face trade-offs between them.

Third, the negative interaction may reflect a sequencing issue: business model innovation may need to precede investment in digital transformation to provide the strategic clarity that focuses human capital development efforts. When digital transformation and business model innovation occur simultaneously without clear strategic alignment, the result may be confusion about which competencies employees need to develop, potentially dampening the DT-HCD relationship.

6 | CONCLUSION

This paper investigated the direct effect of digital transformation on human capital development and the moderating roles of customer experience, operational processes, and business model innovation in Ghana's telecommunications sector. The results confirmed that digital transformation has a positive and significant direct effect on human capital development (H1), that customer experience significantly and positively moderates this relationship (H3), and that operational processes exhibit

the strongest positive moderating effect (H4). Business model innovation, contrary to expectations, produced a negative moderating effect (H2 not supported).

6.1 | Theoretical Implications

The paper makes three principal theoretical contributions. First, it extends contingency theory to the DT-HCD relationship, demonstrating empirically that the effectiveness of digital transformation in developing human capital is contingent on the agility of operational processes and the customer-experience orientation of digital initiatives. Second, it enriches the RBV by positioning human capital development as a necessary complement to investment in digital technology, rather than a mere outcome, thereby reinforcing the principle that strategic resources must be developed in concert to achieve sustained competitive advantage. Third, the study enriches organisational learning theory in the DT context by identifying the specific boundary conditions (customer experience and operational dynamism) under which digital transformation catalyses double-loop organisational learning and, in turn, human capital development.

6.2 | Practical Implications

For telecommunications managers, the findings carry several actionable implications. First, digital transformation should not be treated as an isolated technology deployment exercise; it must be accompanied by deliberate, structured human capital development programmes aligned with the competencies required by newly digitised processes. Second, organisations that orient their digital transformation towards improving the customer experience rather than purely internal cost reduction appear to achieve stronger human capital development outcomes. This suggests that customer experience and human capital strategies should be co-designed rather than sequenced. Third, the critical role of operational processes suggests that organisations with rigid, bureaucratic process architectures will derive less benefit from human capital development in digital transformation. Managers should invest in operational agility infrastructure, including flexible process design, cross-functional teams, and a culture of continuous improvement, as preconditions for maximising the human capital returns from digital transformation investments.

6.3 | Regulatory and Policy Implications

For the National Communications Authority (NCA) and the Government of Ghana, the findings underscore the need to align national digital transformation policy with workforce development strategy. Regulatory frameworks should incentivise telecommunications firms to co-invest in digital infrastructure and human capital development, for

example, through licensing conditions that require operators to demonstrate workforce upskilling alongside network modernisation. Additionally, policymakers should support the development of industry-wide digital competency frameworks specific to the telecommunications sector, providing a shared standard against which firms can measure and benchmark their human capital development investments.

6.4 | Limitations and Future Research

This study has several limitations that future research should address. First, the cross-sectional design precludes causal inference; longitudinal studies tracking the DT-HCD relationship over time, particularly across distinct phases of digital transformation maturity, would provide stronger causal evidence. Second, the sample is confined to head office employees of telecommunications firms in Greater Accra, limiting generalisability to other regions, sectors, and industries. Future research should extend the model to other service sectors, manufacturing firms, and different African country contexts.

Third, only three moderating variables were examined. Future studies should consider additional boundary conditions, including market turbulence, competitive intensity, technological uncertainty, and organisational culture, as potential moderators. Fourth, the study used CB-SEM, which imposes strong distributional assumptions; future research employing PLS-SEM or Bayesian SEM could provide robustness checks and handle non-normality more flexibly. Finally, a qualitative follow-up study exploring practitioners' perspectives on the mechanisms through which digital transformation generates or fails to generate human capital development would enrich the interpretation of the quantitative findings, particularly the unexpected negative moderation of business model innovation.

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None reported.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORS BIOGRAPHY

Frank Boateng is the Acting Director of the Institute of Mineral Resource Investment and Governance (IMRIG) at the University of Mines and Technology, and a senior lecturer in Management Practice in the Department of Management Studies at the University of Mines and Technology (UMaT). Additionally, Dr Boateng is a distinguished Fellow of the IMANI Centre for Policy and Education. He holds a Bachelor's degree in Business Administration (Accounting) from Central University Business School, a Post-Degree Bachelor of Laws (LLB) from Central University Law Faculty, an MBA in Finance from the University of Leicester Business School, an M.Phil. in Business Consulting and Enterprise Risk Management from Kwame Nkrumah University of Science and Technology, and a Ph.D. in Management from Walden University, Minneapolis, Minnesota, USA.

John Armstrong Asabil Etroo is a seasoned business leader and academic with over 14 years of senior-level experience across banking, telecommunications, real estate, logistics, and broadcasting. He currently serves as General Manager of Sametro Company Limited and SCL Sametro Guinea Bissau Sarl, where he drives strategic direction, financial management, operational excellence, and policy implementation. He combines extensive industry expertise with a strong academic foundation in finance, digital transformation, and corporate governance. He is an Adjunct Faculty member at Nobel International Business School, where he teaches Leadership for Digital Transformation. He holds a Bachelor of Commerce from the University of Cape Coast, an MBA in International Finance Controlling, and a Doctorate in Business Administration. He is currently pursuing an MSc in Digital Transformation at the University of Hull and has completed a specialised digital strategy program at the University of Cambridge Judge Business School..