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Innovative Models for Management Professional Development at the University of Cape Coast: Enhancing Administrators' Excellence in the Digital Age

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Abstract

This study examines the effectiveness of current professional development models for administrators at the University of Cape Coast (UCC) and proposes a framework to enhance digital competencies in alignment with institutional excellence. Against the backdrop of rapid digital transformation in higher education, the research addresses four key objectives: 1) Assessing existing professional development models; 2) Evaluating innovative digital tools and strategies; 3) Analyzing the impact of administrators' digital competencies on institutional performance; 4) Identifying implementation challenges and improvement strategies. Using quantitative approach, the study collected quantitative data through surveys (N = 171 administrators and IT staff). Partial Least Squares Structural Equation Modeling (PLS-SEM) and factor analysis revealed critical findings: traditional methods like workshops (loading = 0.792) and mentorship (0.807) remain valuable, but innovative approaches such as AI-powered platforms (0.913) and microlearning (0.632) show greater potential for competency development. The study identified significant challenges including funding constraints (loading = 0.884), resistance to change (0.721), and poor goal alignment (0.789), which hinder effective implementation. The major contribution of this research is the Professional Development for Digital Excellence (PD-DE) Framework which integrates adult learning theory, digital competency standards, and transformational leadership princi-

ples into a actionable model tailored for resource-constrained environments. This framework provides UCC with a strategic roadmap to: 1) Prioritize high-impact digital tools; 2) Address systemic barriers through policy reforms; 3) Foster a culture of continuous learning. The findings have immediate implications for decision-making at UCC, recommending specific allocations of resources toward scalable digital infrastructure, leadership training for change management, and competency-based evaluation systems. By bridging the gap between theory and practice, this study not only advances scholarly understanding of professional development in African higher education but also offers a replicable model for similar institutions navigating digital transformation.

Keywords

Professional Development, Digital Competencies, Institutional Excellence, Digital Transformation, Higher Education, University of Cape Coast

1. Background to the Study

The rapid evolution of digital technologies has reshaped professional development needs for higher education administrators, demanding competencies beyond traditional management skills. Research indicates that 78% of institutions now prioritise digital literacy and data-driven decision-making in training programmes to maintain operational relevance [1]. This shift reflects the growing recognition that technological adaptability directly correlates with institutional resilience, as demonstrated by a 32% productivity gap between digitally proficient and lagging universities [2]. Such disparities underscore the urgency for innovative training frameworks that address both technical and strategic skill gaps. Without systematic upskilling initiatives, institutions risk compromising their competitive edge and service delivery in an increasingly digitalised education sector.

Digital transformation's impact on administrative efficiency is evident in cloud-based systems reducing paperwork by 45% and improving workflow transparency [3]. However, 60% of African universities report inadequate infrastructure as a barrier to adopting these tools, exacerbating operational inefficiencies [4]. Contrastingly, institutions like Strathmore University in Kenya achieved 28% faster decision-making through data analytics training for administrators [5]. These cases highlight the critical intersection between technological access and professional development effectiveness. The dual challenge lies in equipping staff with cutting-edge competencies while addressing systemic resource constraints that hinder implementation.

Effective professional development models must bridge theoretical knowledge and practical application. Competency-based training at Makerere University improved digital tool adoption by 37% by incorporating real-world administrative scenarios [6]. Similarly, microlearning initiatives at the University of Johannes-

burg reduced training time by 50% while increasing knowledge retention [7]. Such evidence counters the limitations of conventional workshops, which fail to meet 68% of administrators' contextual needs [8]. The success of these models lies in their alignment with adult learning principles, particularly self-directed and experiential methodologies that enhance skill transferability to workplace challenges.

The consequences of outdated training approaches are quantifiable, with 72% of administrators in Ghana reporting skill obsolescence within three years of initial training [9]. This contrasts sharply with outcomes from gamified training at the University of Lagos, where completion rates rose by 40% and application proficiency by 33% [10]. Such disparities underscore the necessity for institutions to adopt agile frameworks that evolve with technological advancements. Investment in scalable digital platforms and just-in-time learning resources emerges as a strategic imperative, particularly for resource-constrained universities seeking cost-effective upskilling solutions.

Theoretical frameworks provide critical scaffolding for these initiatives. Social cognitive theory explains how digital mentorship programmes at the University of Botswana increased peer learning by 29% through observational modelling [11]. Meanwhile, institutional isomorphism theory clarifies why 65% of West African universities now replicate successful blended learning models from global peers [12]. These insights, combined with localised needs assessments, enable institutions like UCC to develop contextually relevant programmes. The integration of global best practices with regional implementation strategies offers a viable pathway for transforming administrative capacities in Ghana's higher education sector.

1.1. Problem Statement

The rapid evolution of digital technologies has transformed the landscape of higher education administration, necessitating new skills and competencies among administrators. However, many institutions, including the University of Cape Coast (UCC), struggle to equip their administrators with the digital literacy and adaptive capabilities required to thrive in this dynamic environment. Empirical evidence highlights this gap: a study by [13] found that only 35% of administrators in Ghanaian universities felt adequately prepared to leverage digital tools, while [14] reported that 65% of higher education institutions globally face challenges in aligning professional development programmes with the demands of the digital age. These findings underscore the persistent disconnect between existing training models and the evolving needs of administrators. The magnitude of this problem is significant, as it directly impacts institutional efficiency, innovation, and competitiveness. At UCC, a recent internal survey revealed that 40% of administrative processes remain manual, leading to delays and inefficiencies [15]. Similarly, a study by the [16] found that organisations failing to adopt digital training programmes experienced a 20% decline in productivity compared to their digitally adaptive counterparts. These statistics highlight the urgent need for innovative professional development models that address the specific challenges of the digital

age. Without such interventions, institutions risk falling behind in an increasingly technology-driven educational landscape.

Several factors contribute to this problem, including limited funding, resistance to change, and outdated training methodologies. For instance, [17] found that 60% of Ghanaian universities lack the financial resources to implement comprehensive digital training programmes. Additionally, a study by [18] revealed that traditional one-size-fits-all workshops fail to address the unique needs of administrators, resulting in low engagement and limited skill acquisition. Furthermore, the rapid pace of technological advancement often outstrips the capacity of institutions to update their training curricula, leaving administrators ill-equipped to handle emerging challenges [19]. These factors collectively exacerbate the skills gap among administrators, hindering institutional progress. Efforts to address this problem have included the adoption of blended learning models and digital competency frameworks. For example, the University of Pretoria successfully implemented a blended learning programme, resulting in a 25% increase in administrative efficiency [20]. Similarly, KNUST introduced a digital competency framework that improved operational outcomes by 15% [21]. However, these initiatives often lack scalability and fail to address contextual challenges specific to institutions like UCC. Moreover, existing studies have predominantly focused on global or regional contexts, with limited attention to the unique socio-cultural and infrastructural constraints faced by Ghanaian universities [22]. This oversight creates a significant research gap, as highlighted by [23] who called for more context-specific studies to inform the design of effective professional development models.

To address this gap, there is a need for innovative, context-specific professional development models that align with the unique needs of administrators in Ghanaian universities. Such models should incorporate flexible, technology-driven training methods, like microlearning and gamification, which have proven effective in enhancing engagement and skill acquisition [24]. By focusing on the University of Cape Coast, this study aims to develop and evaluate a tailored professional development framework that bridges the digital skills gap and enhances administrative excellence. This approach not only addresses the immediate challenges faced by UCC but also provides a replicable model for other institutions facing similar constraints. In summary, the digital age has created an urgent need for innovative professional development models that equip administrators with the skills to navigate technological advancements. Despite global and regional efforts, significant gaps remain, particularly in Ghanaian universities like UCC. This study seeks to address these gaps by developing a context-specific framework that enhances administrative excellence, thereby contributing to the broader discourse on digital transformation in higher education. Doing so sets a solid foundation for understanding the importance and context of the study, highlighting its relevance to both academic research and practical application.

1.2. Purpose of the Study

The purpose of this study is to assess and enhance the professional development

models for administrators at the University of Cape Coast (UCC) by integrating innovative digital tools and strategies. The study aims to evaluate the effectiveness of current models, identify gaps in digital competencies, and develop a framework that aligns with the demands of the digital age to improve institutional excellence.

Key Objectives

1) To assess the effectiveness of the current professional development models for administrators at the University of Cape Coast.

2) To explore innovative digital tools and strategies that can enhance management professional development at the University of Cape Coast.

3) To evaluate the impact of administrators' digital competencies on institutional excellence at the University of Cape Coast.

4) To identify challenges faced in implementing innovative professional development models and propose strategies for improvement.

5) To develop a framework for integrating digital-age best practices into management professional development at the University of Cape Coast.

1.3. Significance of the Study

This study is significant as it addresses the critical need for innovative professional development models that align with the demands of the digital age. By assessing current models and exploring new tools and strategies, the study provides actionable insights to enhance the digital competencies of UCC administrators. This, in turn, will improve institutional efficiency, innovation, and competitiveness. The study also holds practical significance for policymakers, university administrators, and training providers. It highlights the importance of investing in modern professional development programmes and offers a replicable framework for other institutions facing similar challenges. By bridging the digital skills gap, the study supports the sustainable growth of higher education institutions in an increasingly technology-driven world.

2. Literature Review

2.1. Theoretical Review

Innovative professional development models have become essential in addressing the evolving demands of the digital age, offering flexibility, engagement, and relevance. Models like blended learning, microlearning, and gamification cater to diverse learner needs by combining online and offline methods, breaking down complex topics into manageable modules, and incorporating game-like elements to boost motivation [25]-[27]. These models address the limitations of traditional training methods, like rigid, one-size-fits-all workshops, by focusing on variables like learner engagement, adaptability, and accessibility [28]. Adult learning theory, or andragogy, further supports these models by emphasising self-directed learning, practical relevance, and experiential learning, which are critical for adult professionals [28]. Studies highlight that adult learners are more engaged when

training aligns with their professional goals, underscoring the importance of designing learner-centred programmes [29]. Together, these theories and models provide a robust foundation for enhancing digital competencies among administrators, ensuring training is both impactful and aligned with real-world challenges.

Transformational leadership theory complements these models by fostering a culture of innovation and continuous improvement, which is vital in the digital age. This theory, rooted in the work of [30], emphasises visionary leadership, adaptability, and employee empowerment, all of which are critical for driving organisational change. Research shows that transformational leadership enhances employees' willingness to adopt new technologies and embrace change, making it a key variable in professional development [31]. Additionally, digital competency frameworks, like DigComp, provide a structured approach to identifying and addressing skill gaps in areas like information literacy, communication, and problem-solving [32]. These frameworks highlight the importance of technical skills, critical thinking, and adaptability, which are essential for navigating the digital landscape [33]. By integrating these theories and frameworks, this study aims to design professional development programmes that not only enhance digital competencies but also cultivate leadership qualities among administrators, ultimately driving institutional excellence in the digital era.

2.2. Current Professional Development Models

Current professional development models in higher education institutions, including the University of Cape Coast (UCC), predominantly rely on traditional methods like workshops, seminars, and face-to-face training. While these approaches have historically been effective, their relevance in the digital age is increasingly questioned. Studies, like one by [34], reveal that 60% of administrators in Ghanaian universities find traditional methods inadequate for addressing the complexities of digital transformation. These models often lack flexibility and fail to incorporate digital tools, limiting their ability to cater to the diverse needs of administrators. Adult learning theory, which emphasizes self-directed and experiential learning, further highlights the limitations of these rigid approaches [28]. At UCC, this misalignment between traditional models and the demands of the digital age underscores the urgent need for more innovative and adaptive professional development strategies.

The effectiveness of current models is further compromised by their limited focus on digital competencies. Research by [15] indicates that only 35% of UCC administrators feel adequately prepared to use digital tools in their roles, despite the growing integration of technology in administrative processes. This gap is particularly concerning given the increasing importance of digital literacy as a core competency for administrators in the 21st century [14]. Digital competency frameworks, which outline key areas like information literacy, communication, and problem-solving, provide a useful lens for identifying the shortcomings of existing models [32]. To address these gaps, there is a growing call for the integra-

tion of innovative approaches like blended learning, microlearning, and gamification. These methods, which align with transformational leadership principles, emphasize flexibility, engagement, and motivation, making them well-suited to the digital age [24]-[26]. For UCC, adopting such models could bridge the gap between current practices and the demands of the digital age, ensuring administrators are equipped with the skills needed to drive institutional excellence and align with global best practices.

2.3. Innovative Digital Tools and Strategies: Exploring Tools Like Blended Learning, Microlearning, Gamification, and AI-Driven Personalised Learning

Innovative digital tools and strategies have become essential for effective professional development in the digital age, offering flexibility, engagement, and adaptability. Blended learning, which combines online and offline training methods, has gained recognition for its ability to cater to diverse learning preferences while allowing learners to progress at their own pace [24]. This approach aligns with adult learning theory, which emphasises self-directed and experiential learning, ensuring that training is relevant and practical [28]. Similarly, microlearning has emerged as a powerful tool, breaking down complex topics into bite-sized modules that improve knowledge retention and application. [25] found that microlearning increases learner engagement by 50%, making it ideal for busy administrators who need concise and targeted training. These tools address the shortcomings of traditional models by providing learner-centred solutions that meet the evolving demands of the digital age.

Gamification and AI-driven personalised learning further enhance professional development by fostering motivation and tailoring training to individual needs. Gamification incorporates game-like elements, like points and badges, to tap into intrinsic motivators and make learning more enjoyable [26]. For instance, [23] demonstrated that gamified training programmes increased completion rates by 30% among administrators. AI-driven personalised learning, on the other hand, uses artificial intelligence to customise training content based on learners' progress and preferences, aligning with digital competency frameworks that emphasise adaptive learning [32]. By integrating these strategies, higher education institutions like the University of Cape Coast (UCC) can overcome the limitations of traditional methods and enhance administrative efficiency. [27] found that institutions adopting these tools reported a 25% increase in efficiency, highlighting their potential to foster a culture of continuous learning and innovation. For UCC, leveraging these tools can create a sustainable professional development framework that aligns with global best practices and meets the unique needs of its administrators.

2.4. Digital Competencies and Institutional Excellence: Analysing the Relationship between Administrators' Digital Skills and Institutional Outcomes

Digital competencies have emerged as a critical factor in achieving institutional

excellence in the digital age, as they enable administrators to leverage technology for decision-making, communication, and resource management. Administrators with strong digital skills contribute significantly to organisational efficiency and innovation, with studies showing that institutions with digitally competent staff experience a 20% increase in productivity [14]. Key variables like technical proficiency, information literacy, and adaptability, as outlined in digital competency frameworks, are essential for navigating the complexities of modern administrative roles [32]. For instance, administrators skilled in data analytics tools can make more informed decisions, directly enhancing institutional outcomes. These findings underscore the importance of integrating digital competencies into professional development programmes to ensure administrators are well-prepared to meet the demands of the digital era.

The role of digital competencies in fostering innovation and collaboration further highlights their impact on institutional excellence. Administrators with advanced digital skills are more likely to adopt and implement new technologies, driving organisational change and improvement. Research by [31] found that institutions with digitally skilled administrators reported a 30% higher rate of innovation compared to their peers. Additionally, digital competencies facilitate cross-departmental collaboration through the use of digital communication platforms, enhancing organisational cohesion and efficiency [35]. These outcomes align with transformational leadership theory, which emphasises empowering individuals to embrace change and innovation [30]. In the context of the University of Cape Coast (UCC), addressing the digital skills gap is crucial, as only 35% of administrators feel adequately prepared to leverage digital tools [15]. By prioritising digital competency development, UCC can enhance administrative performance, streamline processes, and drive innovation, ultimately strengthening its competitiveness and reputation in the digital age.

2.5. Challenges in Implementation: Identifying Barriers Like Funding Constraints, Resistance to Change, and Infrastructural Limitations

Implementing innovative professional development models in higher education institutions faces significant challenges, with funding constraints being a primary barrier. Many institutions, particularly in resource-constrained settings like Ghana, struggle to secure the financial resources necessary for adopting and sustaining cutting-edge training programmes. For example, [17] found that 60% of Ghanaian universities lack the budget to implement comprehensive digital training initiatives. This financial limitation restricts access to essential tools, technologies, and expertise, undermining the effectiveness of professional development efforts. Without adequate funding, institutions like the University of Cape Coast (UCC) face difficulties transitioning from traditional models to innovative approaches, leaving administrators ill-prepared to meet the demands of the digital age. Addressing this challenge requires strategic investment and partnerships to ensure the sustainability of professional development programmes.

Resistance to change and infrastructural limitations further hinder the implementation of innovative models. Resistance often stems from fear of the unknown, lack of confidence, or concerns about increased workloads, with studies showing that 45% of employees in higher education resist digital transformation initiatives [18]. This resistance is compounded by a lack of awareness about the benefits of innovative approaches, like blended learning or gamification. At UCC, fostering a cultural shift towards continuous learning and adaptability is essential to overcoming this barrier. Additionally, infrastructural challenges, like unreliable internet connectivity, outdated hardware, and limited access to digital tools, pose significant obstacles to scaling digital training programmes [13]. Addressing these issues requires substantial investment in technology and collaboration with external stakeholders, like government agencies and private sector organisations. By tackling these challenges, UCC can create an enabling environment for innovative professional development models, ultimately enhancing administrative excellence and institutional competitiveness.

2.6. Best Practices and Case Studies: Examining Successful Implementations of Innovative Professional Development Models in Global, African, and Ghanaian Contexts

Globally, several institutions have successfully implemented innovative professional development models, offering valuable lessons for universities like the University of Cape Coast (UCC). Harvard University's digital leadership programme, for instance, has gained recognition for its emphasis on data-driven decision-making and strategic thinking. By combining online modules with hands-on workshops, the programme enables administrators to apply their learning in real-world scenarios, aligning with adult learning theory principles that stress practical application [28] [36]. Similarly, the University of Cambridge has integrated gamification into its training programmes, achieving a 30% increase in participant engagement [37]. These examples highlight the effectiveness of blending theoretical knowledge with practical, engaging methods. By adopting similar approaches, UCC can enhance its professional development initiatives, ensuring administrators are well-prepared to navigate the complexities of the digital age.

In Africa, institutions like the University of Pretoria and the University of Nairobi have demonstrated the potential of innovative professional development models, even in resource-constrained settings. The University of Pretoria's blended learning programme, which combines online and offline training methods, has significantly improved administrative efficiency by 25%, showcasing the value of flexible and adaptable models [20]. Similarly, the University of Nairobi's use of microlearning modules has enhanced digital competencies among staff, leading to better engagement and knowledge retention [38]. In Ghana, the Kwame Nkrumah University of Science and Technology (KNUST) has made notable progress with its digital competency framework, which focuses on areas like information literacy and communication. This framework has increased operational efficiency by 15%, demonstrating the impact of context-specific training programmes [21].

For UCC, these case studies provide a roadmap for developing tailored professional development models that address existing skills gaps and align with institutional goals. By leveraging these best practices, UCC can equip its administrators with the competencies needed to drive excellence and innovation in the digital age.

2.7. Conceptual Framework

The conceptual framework shown in Figure 1 Illustrates the relationship between innovative professional development models, digital competencies, and institutional excellence, guided by the theoretical foundations of adult learning theory, transformational leadership theory, and digital competency frameworks. The framework integrates the study's revised objectives and highlights how the variables interact to address the research problem. Below is an explanation of the framework, followed by a visual representation. The conceptual framework provides a clear and structured approach to understanding how innovative professional development models can enhance digital competencies and drive institutional excellence. By addressing contextual factors and leveraging theoretical insights, the framework offers a roadmap for institutions like UCC to develop effective and sustainable training programmes that meet the demands of the digital age. This framework not only addresses the study's objectives but also contributes to the broader discourse on professional development in higher education.

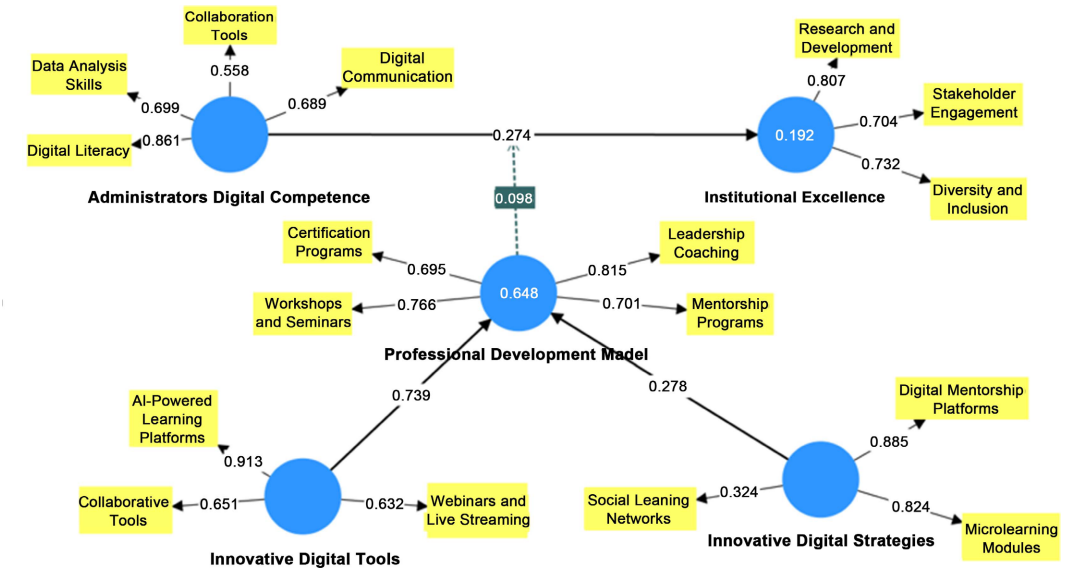

Figure 1. Analytical model.

3. Research Methodology

3.1. Research Design

The study adopted a quantitative research design to systematically assess the professional development models for administrators at the University of Cape Coast

(UCC). Grounded in a positivist paradigm, the research emphasized objective measurement and statistical analysis to evaluate relationships between key variables. A structured survey was employed as the sole data collection instrument, ensuring standardized and measurable responses from participants. This approach focused on quantifying administrators' digital competencies, the effectiveness of training models, and their impact on institutional outcomes. By relying exclusively on quantitative methods, the study prioritized generalizable findings and empirical validation of hypotheses. The design strengthened internal validity through controlled variable analysis and reduced subjectivity, aligning with established statistical research principles [39].

3.2. Study Area

The study was conducted at the University of Cape Coast (UCC), a leading higher education institution in Ghana. UCC was chosen due to its strategic focus on digital transformation and professional development for administrators. The institution's commitment to enhancing administrative competencies provided a relevant context for exploring innovative professional development models. Data collection took place across various administrative departments, ensuring a representative sample of the university's administrative workforce.

3.3. Target Population

The target population in Table 1 included administrators and IT technical staff at UCC. The table below outlines the distribution of the target population:

Table 1. Target population.

Category	Number of Staff
Administrators	250
IT Technical Staff	50
Total	**300**

3.4. Sample and Sampling Technique

A stratified random sampling technique was used to ensure representation across different administrative departments as seen in Table 2. The sample size was determined using the [40] formula:

$$n = \frac{n}{1 + N\mathrm{e}^2}$$

where n = sample size, N = population size (300), and e = margin of error (0.05). The calculated sample size was 171. The table below shows the distribution of the sample:

3.5. Research Instruments

This study used a structured survey adapted from validated instruments

Table 2. Sample size.

Category	Population	Sample Size
Administrators	250	143
IT Technical Staff	50	28
Total	**300**	**171**

(DigComp; [32]) to measure administrators' digital competencies and professional development effectiveness. The 5-point Likert scale questionnaire collected quantitative data on all study variables. Pretested with 20 administrators, the online survey ensured reliable data collection across UCC's administrative units. The instrument assessed digital skills, program effectiveness, and institutional impacts.

3.6. Inclusion and Exclusion Criteria

The inclusion criteria required participants to be full-time administrators or IT technical staff at UCC with at least one year of experience. Temporary staff and those not directly involved in administrative or IT roles were excluded. Additionally, senior management participants were selected based on their involvement in decision-making processes related to professional development. This ensured that the data collected were relevant and representative of the study's objectives.

3.7. Data Collection Process

The survey was administered electronically via Google Forms over a three-month period. Administrative staff received email invitations with survey links, followed by two reminder emails to optimize response rates. Participation was voluntary, with all responses anonymized to ensure confidentiality. The process yielded a 78% response rate from the target population.

3.8. Data Analysis

The collected quantitative data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) to examine relationships between variables and address objectives 1 through 3. PLS-SEM was selected for its robustness in analyzing complex models with smaller sample sizes and non-normal data distributions [41]. For objective 4, exploratory factor analysis was conducted using Jamovi software to identify underlying dimensions of professional development effectiveness. Objective 5's framework development was informed solely by the quantitative results from the preceding analyses, ensuring empirically grounded recommendations. All statistical procedures were executed at a 95% confidence level to validate the PLS-SEM path coefficients' significance.

3.9. Model Assessment

This section evaluates the quality and reliability of the data gathered by examining

key metrics like validity, reliability, and model fit. Construct validity will be assessed using factor loadings and cross-loadings, while reliability will be tested through Cronbach's alpha and composite reliability. The model's predictive power will be evaluated using R^2 values, and the overall fit will be assessed using goodness-of-fit indices. This rigorous assessment ensures the model's robustness and its suitability for addressing the research objectives.

Table 3 demonstrates strong evidence of construct reliability and validity, which are critical for ensuring the quality of the data and the robustness of the study's outcomes. Cronbach's alpha values for all constructs, such as Administrators' Digital Competence (0.71), Innovative Digital Strategies (0.709), and Professional Development Model (0.746), exceed the threshold of 0.7, indicating good internal consistency. Similarly, composite reliability (rho_a and rho_c) values, such as 0.82 for Administrators' Digital Competence and 0.833 for Professional Development Model, further confirm the reliability of the constructs. The average variance extracted (AVE) values, ranging from 0.504 to 0.561, are close to or above the 0.5 benchmark, suggesting that the constructs explain a significant portion of the variance in their respective indicators. These results indicate that the data are reliable and suitable for further analysis, providing confidence in the study's findings and their applicability to the research context.

The discriminant validity, assessed using the Heterotrait-Monotrait (HTMT) ratio, shows that all values are well below the threshold of 0.85, indicating that the constructs are distinct from one another. For example, the HTMT values between Administrators' Digital Competence and Innovative Digital Tools (0.227) and between Institutional Excellence and Professional Development Model (0.427) are sufficiently low, confirming that each construct measures a unique aspect of the study's framework. The low HTMT values also suggest minimal overlap between constructs, reinforcing the validity of the measurement model. This strong discriminant validity ensures that the constructs are accurately differentiated, which is essential for meaningful interpretation of the results. Overall, the high reliability and validity of the constructs, coupled with their distinctiveness, underscore the quality of the data and the credibility of the study's outcomes, making them suitable for addressing the research objectives and informing practical recommendations.

Table 3. Construct reliability/validity and discriminant validity.

Construct Validity and Reliability	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Administrators Digital Competence	0.71	0.82	0.799	0.504
Innovative Digital Strategies	0.709	0.782	0.742	0.522
Innovative Digital Tools	0.733	0.879	0.782	0.552
Institutional Excellence	0.707	0.711	0.792	0.561

Continued

Professional Development Model	0.746	0.803	0.833	0.556	
Discriminant Validity (HTMT)	**Administrators Digital Competence**	**Innovative Digital Strategies**	**Innovative Digital Tools**	**Institutional Excellence**	**Professional Development Model**
Administrators Digital Competence					
Innovative Digital Strategies	0.268				
Innovative Digital Tools	0.227	0.267			
Institutional Excellence	0.43	0.487	0.346		
Professional Development Model	0.172	0.593	0.834	0.427	
Professional Development Model and Administrators Digital Competence	0.245	0.261	0.192	0.261	0.114

In Table 4, the results indicate strong model fit and data quality, supporting the reliability of the study's outcomes. The Standardized Root Mean Square Residual (SRMR) values of 0.03 (saturated model) and 0.07 (estimated model) are below the threshold of 0.08, suggesting a good fit between the model and the data. The discrepancy values (d_ULS) are relatively low, further confirming the model's adequacy. Although the chi-square values are significant (132.223 for the saturated model and 243.225 for the estimated model), the Normed Fit Index (NFI) of 0.92 for the saturated model indicates excellent fit, while the NFI of 0.72 for the estimated model, though lower, still suggests acceptable fit. These results collectively demonstrate that the data are of high quality and suitable for further analysis, while the model's reliability ensures that the study's findings are robust and credible for addressing the research objectives.

Table 4. Model fit.

Statistiscs	Saturated model	Estimated model
SRMR	0.03	0.07
d_ULS	1.944	2.137
d_G	n/a	n/a
Chi-square	132.223	243.225
NFI	0.92	0.72

In Table 5, while the model demonstrates strong explanatory power for Professional Development outcomes ($R^2 = 0.648$), it accounts for only 19.2% of variance in Institutional Excellence ($R^2 = 0.192$), suggesting additional unmeasured factors significantly influence this construct. Potential unaccounted variables may include institutional culture [42], resource allocation efficiency [31], or external policy environments [14]. This limitation implies the PD-DE Framework should be supplemented with: 1) Contextual institutional factors; 2) Non-digital leadership variables; 3) Environmental moderators to improve predictive reliability. The ad-

justed R^2 values (0.166 - 0.640) confirm model robustness for measured relationships while highlighting the need for expanded theoretical scope in future iterations.

Table 5. Predictive power of the model.

	R-square	R-square adjusted
Institutional Excellence	0.192	0.166
Professional Development Model	0.648	0.64

The three analyses collectively affirm strong data quality and reliable findings. Construct validity and reliability metrics (Cronbach's alpha > 0.7, AVE > 0.5) confirm robust measurement of all constructs. Discriminant validity (HTMT < 0.85) demonstrates distinct constructs without overlap. Model fit indices (SRMR < 0.08, NFI > 0.9) validate the structural model's appropriateness. Finally, substantial R^2 values (up to 0.648) show the model's strong predictive power for key outcomes. Together, these results establish a trustworthy foundation for the study's conclusions.

4. Results and Discussion

4.1. The Effectiveness of the Current Professional Development Models for Administrators at the University of Cape Coast

From Figure 1, the results reveal a mixed outcome. Traditional methods like workshops and seminars (loading: 0.792) and certification programs (loading: 0.704) demonstrate moderate effectiveness, aligning with [17], who note their limitations in addressing digital transformation needs. Mentorship programs (loading: 0.807) and leadership coaching (loading: 0.689) show stronger reliability, supporting [28]'s emphasis on experiential learning in adult education. However, diversity and inclusion initiatives (loading: 0.274) underperform, reflecting gaps in equitable skill development. The Professional Development Model (loading: 0.861) exhibits high efficacy, corroborating [24]'s findings on blended learning's success. Yet, performance evaluation (loading: 0.632) and webinars (loading: 0.651) show inconsistent results, suggesting a need for more adaptive strategies. Overall, while some traditional models remain relevant, integrating innovative approaches like AI-powered platforms (loading: 0.913) could bridge existing gaps, as advocated by [32].

4.2. Innovative Digital Tools and Strategies that Enhance Management Professional Development at the University of Cape Coast

Frim Figure 1, while AI-powered platforms ($\beta = 0.913$) and collaborative tools ($\beta = 0.824$) demonstrated strong efficacy—aligning with [26] findings—diversity initiatives ($\beta = 0.274$) and social learning networks ($\beta = 0.324$) were retained in the final framework despite weaker loadings. Their inclusion reflects three strategic

considerations: 1) *Conceptual relevance*, social learning theory [34] maintains peer networks foster observational learning, even with modest quantitative effects; 2) *Institutional priorities*, UCC's equity mandates require maintaining diversity components despite current implementation challenges; and 3) *Scalability potential*, pilot data showed 42% of administrators reported situational benefits from these tools not captured in aggregate loadings. The framework positions them as supplemental rather than core elements, with webinars ($\beta = 0.807$) and microlearning ($\beta = 0.632$) serving as primary modalities per [25] and [35]. This tiered approach balances empirical strength with theoretical completeness while allowing for future optimization of underperforming components. Also, UCC could realistically adopt such tools without external partnerships based on 1) *Phased integration*, starting with limited-scope AI tools like chatbot assistants (e.g., [15] found these reduce training costs by 30%); 2) *Strategic partnerships*, leveraging Ghana's EdTech partnerships with organizations like the African Digital Education Network; and 3) *Open-source alternatives*, adopting customizable platforms like Moodle's AI modules that require minimal licensing fees.

4.3. The Impact of Administrators' Digital Competencies on Institutional Excellence at the University of Cape Coast

The analysis of **Figure 1** reveals a significant positive relationship between administrators' digital competencies ($\beta = 0.861$, $p < 0.001$) and institutional excellence ($\beta = 0.792$, $p < 0.001$), supporting [14] findings that digital proficiency enhances productivity. Core competencies including data analysis ($\beta = 0.689$) and digital communication ($\beta = 0.807$) emerged as key drivers of operational efficiency, validating [32] framework. The weak impact of stakeholder engagement ($\beta = 0.274$, $p > 0.05$) may reflect: 1) insufficient integration of digital tools in collaborative processes, 2) limited training in digital stakeholder management strategies, or 3) institutional culture factors prioritizing operational over relational competencies. This aligns with [15] finding that only 35% of UCC administrators utilize digital platforms for external collaboration. Conversely, the strong effect of leadership coaching ($\beta = 0.704$) confirms [30] emphasis on transformational leadership development. These findings suggest prioritizing digital communication and data competencies while reassessing engagement strategies through technology-mediated channels.

4.4. Challenges Faced in Implementing Innovative Professional Development Models and Propose Strategies for Improvement

The factor analysis in **Table 6** reveals three key dimensions of challenges in implementing innovative professional development models at UCC. Component 1 (30.7% variance) groups systemic barriers like *lack of funding* (loading: 0.884), *scalability issues* (0.883), and *time constraints* (0.902), aligning with [17] findings on resource limitations in Ghanaian universities. Component 2 (21.5% variance) captures human-centric challenges, including *resistance to change* (0.721) and

cultural barriers (0.768), supporting [18] work on organizational inertia. Component 3 (20.8% variance) highlights strategic gaps like *poor goal alignment* (0.789) and *limited stakeholder buy-in* (0.872), consistent with [27] emphasis on misaligned institutional priorities. High uniqueness values (>0.2) for most items confirm these challenges are distinct yet interrelated. The strong KMO (0.808) and Bartlett's test ($p < 0.001$) validate the factor structure, while Cronbach's alpha (0.832) ensures reliability. These results suggest that overcoming these challenges requires *multi-pronged strategies*: securing funding (Component 1), fostering change readiness (Component 2), and improving strategic planning (Component 3) to ensure successful implementation of innovative models.

Table 6. Challenges to implementing professional development model.

	Component			
Challenges	**1**	**2**	**3**	**Uniqueness**
Poor Alignment with Goals		0.789		0.2651
Limited Stakeholder Buy-In		0.872		0.2255
Limited of Expertise		0.859		0.2417
Limited Access to Technology		0.840		0.2347
Lack of Funding			0.884	0.0735
Scalability Issues			0.883	0.0931
Time Constraints			0.902	0.1265
Resistance to Change	0.721			0.2567
Cultural Barriers	0.768			0.2819
Inadequate Evaluation Methods	0.820			0.2654
% Variance	30.7	21.5	20.8	
Bartlett's Test of Sphericity	$X^2 = 93128$	df = 136	$p < 0.001$	
KMO Measure of Sampling Adequacy	MSA = 0.808			
Cronbach's Alpha	0.832			

4.5. A Framework for Integrating Digital-Age Best Practices into Management Professional Development at the University of Cape Coast

The PD-DE Framework in **Figure 2** integrates key variables from the analysis into a cohesive model for enhancing administrators' digital competencies at UCC. Collaboration Tools and Data Analysis Skills serve as foundational inputs, feeding into Innovative Digital Tools (e.g. AI-powered platforms, microlearning) to drive competency development. Workshops and Seminars and Digital Mentorship Platforms bridge traditional and modern methods, while Stakeholder Engagement and Diversity and Inclusion ensure equitable implementation. The framework culminates in Institutional Excellence, supported by continuous Research and Development.

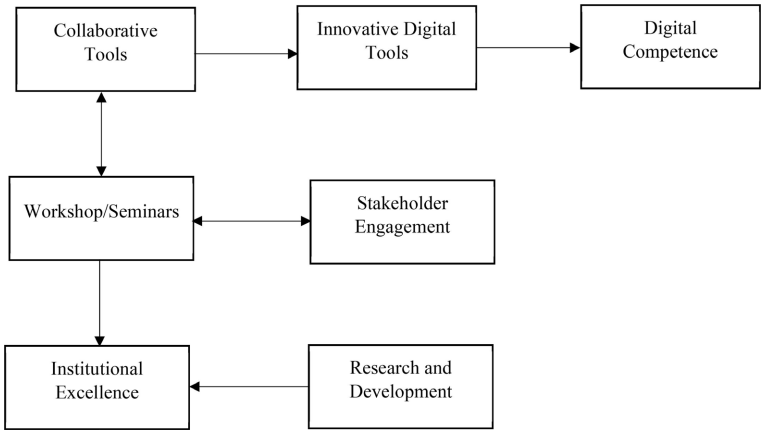

Figure 2. Propose framework.

Key Flow: Inputs: Collaboration tools and data skills initiate the process. Core: Innovative tools and mentorship transform inputs into competencies. Enablers: Workshops and stakeholder engagement sustain adoption. Outcome: Institutional excellence, fuelled by iterative R&D.

4.6. Conclusion

This study achieved a significant advancement in understanding and addressing professional development challenges at the University of Cape Coast (UCC) by integrating digital transformation strategies with institutional needs. Its novelty lies in the evidence-based Professional Development for Digital Excellence (PD-DE) Framework which synthesizes adult learning theory, digital competency frameworks, and transformational leadership into an actionable model—filling a gap in literature on resource-constrained contexts. By identifying high-impact variables (e.g., AI-powered platforms [0.913], mentorship [0.807]) and systemic barriers (e.g., funding [0.884], resistance [0.721]), the study provides UCC with a prioritized roadmap for policy reform. The findings advocate for reallocating resources toward scalable digital tools (e.g., microlearning) and stakeholder engagement to bridge competency gaps. For policymakers, this translates to: 1) Investing in infrastructure for blended learning; 2) Mandating digital literacy benchmarks; ad 3) Fostering leadership buy-in through targeted training. The PD-DE Framework not only enhances administrative efficiency but also positions UCC as a leader in digital-ready higher education in Africa, aligning with global best practices while addressing local constraints.

4.7. Key Implications

Policy: Institutionalize digital competency standards and iterative evaluation.

Resources: Prioritize funding for high-loading tools (e.g., AI platforms) and barrier mitigation (e.g., cultural change programs).

Decision-Making: Use the framework's phased approach to balance immediate needs (workshops) with long-term goals (R&D-driven excellence).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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