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Use of ICT and AI in Faculty Development of Higher Education Institutions

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Abstract

The rapid evolution of Information and Communication Technology (ICT) and Artificial Intelligence (AI) has fundamentally redefined Faculty Development (FD) within Higher Education Institutions (HEIs). Traditionally, FD relied on periodic, generalized workshops that often struggled to address individual pedagogical needs or keep pace with technological shifts. This paper explores how the integration of AI-driven personalization and ICT-enabled collaborative networks has transitioned faculty development into a continuous, data-informed, and highly adaptive ecosystem.

The core advantage of this digital transformation lies in the shift from passive consumption to active orchestration. Through AI-powered learning analytics, faculty members now receive real-time feedback on teaching efficacy and student engagement, allowing for immediate pedagogical refinement. ICT tools have dissolved geographical barriers, fostering Virtual Communities of Practice (VCoPs) that enable cross-institutional mentorship and global knowledge sharing. Furthermore, generative AI has emerged as a critical "cognitive partner," automating administrative burdens—such as syllabus design and assessment grading—thereby permitting educators to refocus on high-value human interactions, including mentorship and ethical inquiry. However, the implementation of these technologies is not without challenges. The abstract highlights the necessity of addressing the digital divide and ensuring AI literacy among diverse faculty cohorts. Institutional success in 2024 is increasingly measured by how effectively HEIs cultivate "AI orchestration" skills, moving beyond basic technical competency toward a sophisticated understanding of digital ethics and hybrid pedagogy. In conclusion, the synergy of ICT and AI in faculty development does not merely enhance existing workflows; it creates a more resilient, innovative, and student-centric academic workforce. By embracing these technologies, HEIs can ensure that their faculty remain at the cutting edge of global education standards, prepared to lead in an increasingly automated yet deeply human-centered learning environment.

Keywords: ICT, AI, faculty development, Higher Education.

1. Introduction

The landscape of Higher Education (HE) in 2024 is defined by a profound digital metamorphosis, where Information and Communication Technology (ICT) and Artificial Intelligence (AI) have shifted from peripheral support tools to the very core of faculty development (FD). Traditionally, faculty development focused on pedagogical workshops and manual peer reviews; however, the rapid acceleration of generative models and immersive technologies has necessitated a more dynamic, "augmented" approach to professional growth.

In contemporary HEIs, ICT provides the essential infrastructure—utilizing high-speed networks, cloud-based collaborative platforms, and Virtual Reality (VR) simulations—to create immersive training environments. These technologies allow educators to practice complex classroom management and experimental teaching strategies in risk-free digital spaces. Parallel to this, AI has emerged as a cognitive partner, offering personalized professional development pathways. Rather than "one-size-fits-all" seminars, AI-driven analytics now provide faculty with real-

time feedback on their instructional efficacy, automate administrative burdens, and assist in the rapid prototyping of inclusive, AI-resilient curricula.

However, this integration is not merely about technical proficiency. It represents a cultural shift toward algorithmic literacy and ethical stewardship. As faculty members navigate the challenges of academic integrity and the "digital divide," development programs now prioritize the Human-in-the-Loop model. This ensures that while AI enhances efficiency and data-driven insights, the uniquely human elements of teaching—empathy, critical inquiry, and ethical mentorship—remain at the forefront of the educational experience. Consequently, the introduction of ICT and AI in faculty development is no longer an elective innovation but a strategic imperative for institutional resilience and student success in a globalized, automated economy.

2. Origin of ICT and AI

The origins of ICT and AI are deeply intertwined, rooted in the mid-20th-century quest to automate logic and expand

human communication. While ICT provided the "nervous system" of connectivity, AI emerged as the "brain" designed to process that information.

The Dawn of ICT (1940s–1970s): ICT's lineage began with the shift from analog to digital. The development of the ENIAC in 1945 proved that large-scale electronic calculation was possible. However, the true "communication" aspect arrived with ARPANET in 1969, the precursor to the Internet. This era was defined by the transition from telecommunications (radio/telephone) to Information Technology, as researchers figured out how to packetize data. By the 1970s, the invention of the microprocessor made computing portable, laying the groundwork for the networked world we inhabit today.

The Birth of AI (1950s): The formal origin of AI is often traced to the Dartmouth Workshop of 1956, organized by John McCarthy, Marvin Minsky, and others. They proposed that "every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it." Earlier, in 1950, Alan Turing published *Computing Machinery and Intelligence*, introducing the "Turing Test" as a benchmark for machine thought. Following initial optimism, AI faced several "winters"—periods of reduced funding and interest—because the ICT infrastructure of the time lacked the processing power and data storage to support complex neural networks. The two fields finally converged in the late 1990s and early 2000s. The explosion of Big Data (an ICT achievement) provided the "fuel" that AI algorithms needed to learn through Deep Learning.

3. Concepts of ICT and AI

To understand the modern educational landscape, one must distinguish between the infrastructure of digital tools and the intelligence that drives them. While often grouped together, Information and Communication Technology (ICT) and Artificial Intelligence (AI) serve distinct yet complementary roles in faculty development and higher education.

Information and Communication Technology (ICT)

ICT is the foundational ecosystem of hardware, software, and networking that allows for the storage, retrieval, and transmission of information. In a university setting, ICT is the "digital plumbing." It encompasses:

- **Infrastructure:** Learning Management Systems (LMS), video conferencing (Zoom/Teams), and cloud computing.
- **Connectivity:** High-speed internet and mobile technologies that facilitate "anywhere, anytime" learning.
- **Collaboration:** Digital repositories and communication tools that allow faculty to share resources across global networks.

Essentially, ICT focuses on access and delivery. It provides the stage upon which modern education is performed, ensuring that information is no longer confined to physical libraries or lecture halls.

Artificial Intelligence (AI)

If ICT is the stage, AI is the cognitive engine that performs within it. AI refers to systems or machines that mimic human intelligence to perform tasks and can iteratively improve themselves based on the information they collect. Key concepts include:

- **Machine Learning (ML):** Algorithms that recognize patterns in data—such as student performance trends—to predict outcomes.

- **Natural Language Processing (NLP):** Technology that allows AI to understand, interpret, and generate human language, powering chatbots and automated feedback tools.
- **Generative AI:** Systems capable of creating new content, from lesson plans to complex code, based on specific prompts.

The Intersection: Smart Systems

The synergy between the two is where true innovation occurs. ICT provides the data and the platform, while AI provides the analysis and personalization. For example, an LMS (ICT) collects data on how long a professor spends on a module, but an AI algorithm (AI) analyzes that data to suggest a more efficient workflow or a personalized training path.

Together, they shift the educator's role from a simple transmitter of knowledge to a designer of high-tech, high-touch learning experiences.

4. Use of ICT and AI in Faculty Development of Higher Education

The intersection of Information and Communication Technology (ICT) and Artificial Intelligence (AI) has moved beyond being mere "technical skills" to becoming the permanent operational reality for Higher Education Institutions (HEIs). Faculty development (FD) now focuses on a "human-in-the-loop" model, where technology augments the educator's role rather than replacing it.

- **Algorithmic Literacy:** Institutions are prioritizing training that helps faculty understand AI logic, biases, and ethical implications.
- **The Teacher-AI-Student Dynamic:** UNESCO's 2024 update to the *AI Competency Framework for Teachers* highlights that the traditional classroom dyad has evolved into a triad.
- **Assessment Redesign:** Faculty are being trained to move away from "polished output" grading to process-based evaluation, using AI to track how students arrive at their answers.

Practical Applications in Faculty Development

Faculty are now using specialized ICT and AI tools to enhance their professional capabilities across three core areas:

A. Pedagogical Innovation

- **AI Co-Pilots:** Faculty use AI as a design partner for syllabus creation, rubric generation, and inclusive lesson planning.
- **Simulated Classrooms:** VR/XR environments allow junior faculty to practice classroom management and "difficult conversations" with AI-driven virtual students.
- **The "Traffic Light" Model:** Many institutions have adopted a standard framework for faculty to label assignments: Red (No AI), Yellow (AI-assisted), and Green (AI-integrated).

B. Personalization for Faculty Growth

Professional learning is no longer "one-size-fits-all." AI-driven platforms now provide Personalized Professional Learning (PPL):

- **Adaptive Pathways:** AI analyzes a professor's teaching style and student feedback to suggest specific workshops or micro-credentials (e.g., "Designing Hybrid Labs").
- **Micro-feedback:** Real-time analytics on lecture engagement help faculty adjust their delivery on the fly.

C. Administrative Efficiency

- **Automation of Routine Tasks:** AI tools now handle roughly 30%–40% of routine administrative work, such as basic grading and attendance tracking, freeing up faculty for high-value research and 1-on-1 mentorship.

Table 1: Comparison of Traditional vs. Modern Faculty Development

Feature	Traditional ICT (Pre-2024)	AI-Augmented FD (2025)
Delivery	Scheduled workshops/webinars	On-demand, AI-personalized paths
Focus	How to use the software (e.g., Moodle)	How to prompt and verify AI output
Feedback	Occasional peer observation	Constant, data-driven analytics
Curriculum	Fixed, semester-based updates	Real-time, industry-aligned revisions

Challenges and Ethics

Despite the benefits, faculty development in 2024 faces critical hurdles:

- **The AI Divide:** A growing gap between "AI-native" junior faculty and senior professors who may experience Technostress.
- **Privacy & Surveillance:** Ensuring that teaching analytics are used for *development* and not as punitive tools by administration.
- **Compliance:** HEIs are racing to meet the 2024 accessibility regulatory deadlines, using AI to retroactively caption and format thousands of hours of lecture content.

5. Advantage of ICT and AI in Faculty Development of Higher Education

Information and Communication Technology (ICT) and Artificial Intelligence (AI) have revolutionized Faculty Development (FD), moving it from traditional, periodic workshops to a model of continuous, personalized, and data-driven growth.

Personalized Professional Pathways

- The most significant advantage is the shift toward adaptive learning for educators. AI platforms now analyse a faculty member's specific teaching style, research interests, and student feedback to recommend personalized micro-credentials. This "just-in-time" learning replaces the one-size-fits-all model, allowing professors to upskill in areas like digital ethics or immersive pedagogy at their own pace.

Efficiency and "Role Redefinition"

- ICT and AI tools significantly reduce the administrative burden on faculty.
- **Content Orchestration:** Generative AI assists in drafting syllabi, generating diverse assessment rubrics, and creating interactive lecture materials, cutting preparation time by up to 40%.
- **Automated Logistics:** AI handles routine grading and scheduling, allowing faculty to reclaim time for high-value activities such as student mentorship and deep research.

Data-Informed Pedagogy

- Advanced learning analytics provide faculty with real-time "X-ray vision" into their classrooms. Instead of waiting for end-of-semester evaluations, professors receive instant alerts if a specific cohort is struggling with a concept. This allows for immediate pedagogical adjustments, enabling faculty to become more responsive and agile educators.

Global Collaborative Networks

- ICT has dissolved geographical barriers, fostering Virtual Communities of Practice (VCoPs). Faculty can now engage in cross-institutional "co-teaching" and global peer-review networks. This interconnectedness ensures that even faculty in remote or under-resourced regions stay at the cutting edge of global academic standards.

Research and Innovation Support

- For the "scholar" half of the faculty role, AI tools like literature synthesizers and automated grant-compliance checkers accelerate the research lifecycle. This allows faculty to focus on original hypothesis generation while AI manages the synthesis of vast datasets and administrative filing. The integration of ICT and AI has transformed the faculty role from a "disseminator of information" to an orchestrator of learning experiences. It empowers educators to remain lifelong learners while maximizing their impact on student success.

6. Conclusion

The integration of Information and Communication Technology (ICT) and Artificial Intelligence (AI) within Higher Education Institutions (HEIs) marks a definitive shift from traditional, episodic training to a model of continuous, personalized professional evolution. As we navigate 2024, the conclusion is clear: technology is no longer an external tool added to a professor's toolkit; it is the very infrastructure that enables faculty to thrive in an increasingly complex academic ecosystem. The primary advantage lies in the democratization of expertise. ICT has dissolved geographical and financial barriers, allowing faculty from diverse backgrounds to access global "Communities of Practice." Simultaneously, AI has moved beyond simple automation to become a cognitive partner. By handling labor-intensive tasks—such as syllabus drafting, preliminary grading, and literature synthesis—AI allows educators to refocus on the "human" core of higher education: mentorship, ethical inquiry, and critical discourse. Furthermore, the use of learning analytics has transformed faculty from "lecturers" into pedagogical scientists. The ability to visualize student engagement and learning gaps in real-time empowers faculty to make evidence-based interventions, significantly improving institutional retention and student outcomes. This data-driven approach ensures that faculty development is not just about learning new tools, but about refining the art of teaching through measurable insights. Ultimately, the successful adoption of ICT and AI in faculty development requires a cultural shift toward AI Orchestration. Institutions that prioritize digital literacy and ethical AI use will foster a faculty body that is resilient, innovative, and globally competitive. The goal is not to replace the professor, but to augment their capabilities, ensuring that Higher Education remains a dynamic space for discovery and personal growth in the digital age.

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